Reconstruction of British Columbia Pink Salmon Stock *(Oncorhynchus gorbuscha)*: 1970 - 1982 Part 1: Queen Charlotte Islands, North Coast and Central Coast

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August 1984

RECONSTRUCTION OF BRITISH COLUMBIA PINK SALMON STOCKS (*Oncorhynchus gorbuscha*): 1970 - 1982

PART I: QUEEN CHARLOTTE ISLANDS, NORTH COAST AND CENTRAL COAST

by

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ABSTRACT

Henderson, M. A. and A. T. Charles. 1984. Reconstruction of British Columbia pink salmon stocks (Oncorhynchus gorbuscha): 1970-1982. Part I: Queen Charlotte Islands, North Coast and Central Coast. Can. MS Rep. Fish. Aquat. Sci. 1785: 99 p.

Assessments of all pink salmon stocks from northern and central British Columbia are presented for the period 1970 to 1982. Each stock is reconstructed by year using data on escapement (number and timing) by stock, catch by area and information on migratory routes for each stock. Allocation of catch into component stocks is made proportionate to the escapement of each stock. Outputs of the analyses are total catch, catch by fishery, run size, harvest rate and run timing by stock by year. The quality of the input data and the degree of certainty in the results are discussed.

Key words: pink salmon, assessment, reconstruction

RÉSUMÉ

Henderson, M. A. and A. T. Charles. 1984. Reconstruction of British Columbia pink salmon stocks (Oncorhynchus gorbuscha): 1970-1982. Part I: Queen Charlotte Islands, North Coast and Central Coast. Can. MS Rep. Fish. Aquat. Sci. 1785: 99 p.

On présente les évaluations qui ont été faites de tous les stocks de saumon rose du nord et du centre de la Colombie-Britannique pour la période de 1970 à 1982. Chaque stock est reconstitué par année à partir des données sur la remonte (nombre et époque) par stock, les prises par secteur, et des renseignements sur les routes de migration pour chaque stock. La répartition des prises dans les stocks constituants s'est faite en proportion de la remonte pour chaque stock. On a déduit des analyses les prises totales, les prises par pêche, la taille de la remonte, le taux de capture et l'époque de la remonte par année et par stock. On discute ensuite de la qualité des données fournies et du degré de certitude des résultats.

Mots-clés: saumon rose, évaluation, reconstitution

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Foreword

This report is one in a series of stock assessment documents produced by the Salmon Stock Assessment Unit of Fisheries Research Branch, Department of Fisheries and Oceans (Pacific Region). The report has been made possible through the cooperation and assistance of many people, both within and outside the Department of Fisheries and Oceans.

Ron Kadowaki (Fisheries Research Branch; formerly North Coast management biologist, Field Services Branch) played a major role both in the analysis of North Coast and Queen Charlotte Islands pink stocks, and the writing of the corresponding sections herein. Lynda Orman (Queen Charlotte Islands management biologist, Field Services Branch), Lyle Enderud (Fishery Officer, Area 1), and other members of Field Services Branch on the Queen Charlotte Islands provided much of the information required for analysing that region's stocks. Barry Huber, Barry Rosenburger, and Tim Panko (Fishery officers for Areas 3, 4, and 5 respectively) generously provided their time and expertise, as well as their data, for the North Coast analysis. Angelo Fucchin (British Columbia Fish and Wildlife Branch) kindly made available his Skeena River pink stock analyses, which have been used both in determining escapement timing for those stocks, and in confirming other reconstruction inputs. Dave Peacock, assisted by Ron Goruk (management biologist, Field Services Branch) contributed extensively to the compilation of data required for the reconstruction of Central Coast pink stocks. In addition both provided valuable background information required for interpreting the results of the analyses. Paul Starr (Fisheries Research Branch) prepared the run reconstruction program used for the analysis. Albert Wong (Fisheries Research Branch) wrote summarizing computer programs, gathered and entered data, and generally kept the project together.

Introduction

Pink salmon (Oncorhynchus gorbuscha) is the most abundant salmon species in British Columbia. Between 1970 and 1982 the average annual commercial landing of pink salmon was approximately 18,000 metric tons representing more than 25% of the average annual landings of all five species of Pacific salmon combined. Large commercially exploited stocks of pink salmon originate from many of the coastal streams and all the major rivers of British Columbia excluding those on the west coast of Vancouver Island.

The objective of this report is to generate the information required to assess the status of pink salmon stocks in the northern and central portions of British Columbia (Fig. 1). The same information for south coast pink stocks will be presented in Part II. Specifically we estimate the catch, escapement, total run size percent catch by fishery and harvest rate between 1970 and 1982 for all commercially exploited stocks. In addition, we provide information on the run timing of pink stocks entering the fisheries. The information contained herein is essential both for evaluating the effects of past management actions and for providing a reliable basis on which to develop new management initiatives.

Two unique aspects of the life history of pink salmon must be considered when estimating run sizes and harvest rates. First, the return migration of adult pink salmon takes place during their second year of life. The two year life-cycle is so invariable that fish running in even-numbered calendar years are effectively isolated from odd-year fish so that no gene flow occurs between them. Consequently, estimates of total run size and harvest rate must be considered separately for the two cycles. Secondly, there is considerable evidence that the migration routes of pink salmon to spawning streams varies from year to year (Neave 1964, Pritchard & DeLacy 1944). Consequently, the number and sequence of fisheries that a particular stock passes through may also vary between years. An understanding of the inter-year variation in routing, particularly the variation between even- and odd-year stocks, is important for generating reliable harvest rate estimates at the stock level.

This report is divided into several sections. First is a description of the method of analysis, data sources and an annotated example of the results of the analysis for one stock. This is followed by the stock-by-stock descriptions of the reconstruction results. The stocks described in this report are grouped into three broad, management defined geographical areas (Fig. 1): Queen Charlotte Islands (statistical areas 1, 2W and 2E), North Coast (statistical areas 3, 4 and 5) and Central Coast (statistical areas 6 through 10). The Queen Charlotte Islands and the North Coast have been considered as one overall geographical region, in order to ensure that this reconstruction region was more or less self-contained (although some corrections were necessary as discussed below). Reconstruction results for the Fraser River and South Coast inside waters (statistical areas 11-20, 28 and 29) are presented in Part II. No analysis was undertaken for the fifth major area, the West Coast of Vancouver Island (statistical areas 21-27), because the pink stocks are small and not exploited commercially.

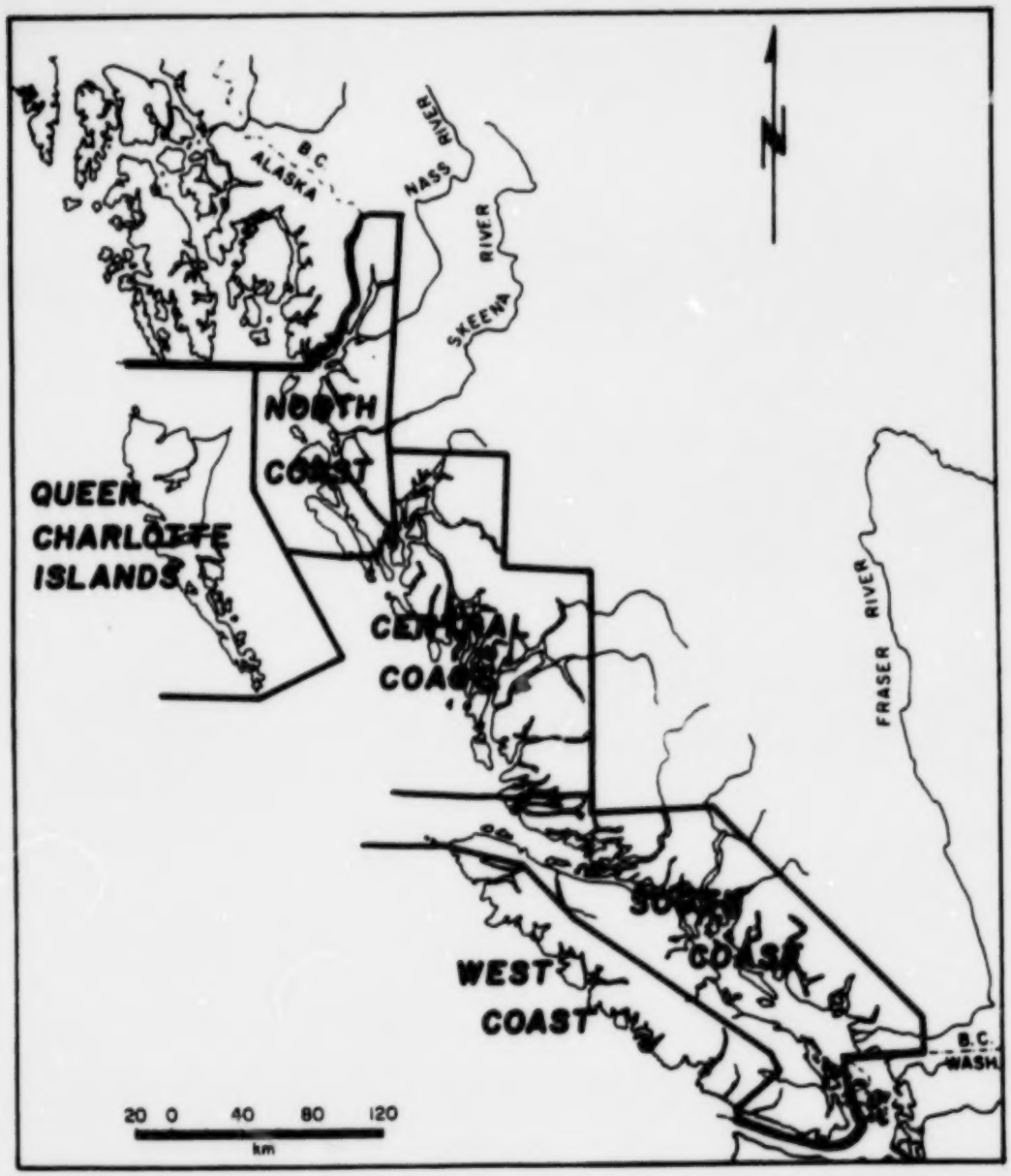


Fig. 1. Five major management areas on the coast of British Columbia

Methodology

The Run Reconstruction Approach

The results presented in this report have been obtained using a method of analysis known as run reconstruction. The method addresses a basis problem in salmon stock assessment: if escapement is measured for each fish stock, while catch is determined by fishery, how can the catch in each fishery be allocated between fish stocks to determine total run size? This question must be resolved before a full analysis of harvest rates, exploitation rates, stock and recruitment, and trends in stock sizes can be undertaken.

To allocate catch between fish stocks, one can either follow a static procedure based on historical proportions of the catch in each fishery arising from each stock, or adopt a systematic dynamic method for analysing the movements of each fish stock through and between the fisheries. The former approach is widely known as the 'PRUNES' method, after the allocation table of the same name ("Pacific Region US-Canada Negotiating System"). It is a static methodology, incorporating potentially out-of-date information on fishing patterns, migration rates and timing, and does not take into account year-to-year variations in relative stock strength. The second approach, which is used in run reconstruction, involves estimates of escapement timing (proportions of the fish stock escaping past the last fishery in each time period), migration routings (the possible ways in which each fish stock passes through the various fisheries), and 'diversion rates' (proportions of each stock following each migration routing). Together, this information makes it possible to track each fish stock through the fisheries on a week-to-week basis. Of course, data on timing, routing and diversion rates is by no means complete and precise, but the experience of fishery officers and biologists, together with results from tagging studies, produces the best current estimates, which can be updated each year as new information becomes available.

The run reconstruction approach works backwards in time. Annual escapement data by stock, together with escapement timing information, produce week-to-week escapement values. Using the assumed diversion rates, each stock is subdivided into 'sub-stocks', each sub-stock corresponding to a stock-migration route combination. (For example, pink runs to Area 4 are assumed to follow one of 3 migration routes into their escapement areas; there are thus 3 sub-stocks corresponding to each major stock of Area 4. Differences in escapement timing can also necessitate differentiating between sub-stocks of a single major stock). Given the week-to-week escapement for each sub-stock, it is essentially a book-keeping exercise to track each sub-stock backwards in time. For each time period, the catch in each fishery is allocated proportionately between all sub-stocks present on the basis of how many fish of each sub-stock are known to have escaped the fishery at the end of the given time period. As the process works back in time, the run of each stock builds up, as more and more catch is added in. Eventually, each sub-stock is tracked back to the time at which it first entered the outer-most fishery along its migration route. At this point, the total entering run has been determined for that sub-stock.

Once catches have been allocated and runs determined, overall harvest rates on each major stock can be calculated, together with the week-by-week timing curve for the entering run of each stock. All this information, when assembled, produces a picture of the stock-by-stock and fishery-by-fishery exploitation pattern for the year under consideration.

While the run reconstruction methodology is straightforward in principle, the key to a successful analysis lies in the choice of appropriate fish stock aggregations, fishery aggregations, and migration route possibilities, as well as the choice of a suitable time step for the analysis. These choices are discussed in Starr & Hilborn (1984), where details of the run reconstruction process are also presented. Here we restrict ourselves to pointing out the questions that must be addressed, and how they are dealt with in this report.

Formulating the Run Reconstruction Analysis

Within each reconstruction region, the relevant stock and fishery aggregations must be determined. Several factors influence the choice of relevant fish stocks:

(1) Does the proposed stock differ in escapement timing and/or migration routing from other stocks?
(2) If not, are there logical reasons for separating the stock from others (such as a different history of exploitation or a special significance)?
(3) In any case, does the proposed set of stocks make sense, with respect to the biological and management concerns?

The stocks used in this report are more aggregated than one might feel appropriate from a biological point of view. However they represent a balance between biological correctness, data availability, computer limitations, and manageability of the fish stocks. The rationale for the choice of stocks is presented, for each geographical region, in the corresponding section below.

The choice of fisheries is intertwined with the selection of a suitable time step for the analysis. If fish move rapidly from the outermost fishery to escapement, then either fisheries must be aggregated into larger units, or a finer time step must be used. The primary requirement is that a given fish must be resident in only one fishery within a given time step. For example, if a time step of one week is used for the North Coast/Queen Charlotte Islands region, then the fisheries of Areas 3, 4 and 5 must be aggregated, since fish can usually move between these areas in less than one week. Alternatively, a shorter time step could be adopted, but this has its limitations since data on catch, escapement timing and travel times are known only imprecisely. For this report a compromise time step of 1/2 week was used in the analysis (but results are presented on a weekly basis for ease of understanding). Using the 1/2 week time period, appropriate fishery aggregations were selected and reasonable estimates of travel times between these fisheries were made.

Once the appropriate fishery combinations have been selected, annual catch data can be examined. The basic sources for this data are: Department of Fisheries and Oceans (DFO) annual B.C. Catch Statistics and DFO Pacific Region Historical Salmon Commercial Catch Data System. In cases where less aggregated catch data is required, the catch of a statistical area is divided among fisheries in proportion to hail figures obtained by fishery officers during the fishery. Data available on a weekly basis has been divided into 1/2 week time periods according to the following general rules:

(1) troll catch in a given week is divided evenly between the 2 halves of the week.
(2) net catch is allocated entirely to the first half of the week, unless information on the fishery in question shows that openings occurred entirely or partially in the second half of the week.

In general, extensive uncertainties in other components of the analysis (timing, routing and diversion rates) are such that great precision in allocating catch between time periods is not warranted.

Escapement data for each stock aggregation were collated from a variety of sources, including stream catalogues, Field Services Branch and Salmon Commission escapement files, and various reports. For purposes of the analysis, native food fishery catch, where significant, has been added into escapement data. (This catch information, available by statistical area, is allocated to major stocks within a statistical area in proportion to the escapement.) However, final results presented below include native food catch under 'Catch' rather than 'Escapement'. Escapement timing information was obtained with widely varying degrees of confidence: sources included test fishery data, 'catch per unit effort' data, stream catalogues, and to a large extent, management biologist and fishery officer estimates. Typically the latter information involved estimates of the start, peak and end of the escapement past the last commercial fishery; a symmetric binomial timing distribution was then fit to these 3 dates, and adjustments made for any unusual features of the timing. Where possible, for example in Area 4, the timing data were obtained for each stock within a stock aggregation, and the overall timing calculated as an average, weighted by the mean relative run size for each stock.

Formulation of migration routing possibilities for each stock is the most difficult aspect of the run reconstruction procedure. While catch and escapement counts and timing estimates are based on physical measurements or observations, migration routes and the proportion of the stock following each route must be inferred from the appearance of fish in the fisheries (unless extensive tagging studies have been carried out in the area). For many northern pink stocks, a large number of possible routes exist from the outermost fisheries to escapement, and the 'diversion rate' proportions are unclear. However past tagging studies, in particular the Central Coast Salmon Tagging Report (Aquatic Resources Ltd., 1980) and the 1982 North Coast Salmon Tagging Report (Gazey and Birdsall, 1983), have been used to provide some guidance in selecting major routing possibilities and reasonable diversion rates for these regions.

Run Reconstruction Results: An Example

As described above, the run reconstruction process occurs on a year-by-year basis. Each run reconstruction produces an analysis of all stocks within the major geographical region under consideration. The 6 outputs produced are as follows:

(1) Summary Table of total annual run, catch, escapement and harvest rate by stock and sub-stock,
(2) The distribution of catch of each stock between fisheries,
(3) The proportional allocation of the catch in each fishery to the stocks vulnerable to that fishery,
(4) The entering run timing for each sub-stock (ie. the proportion of the sub-stock entering the outermost fishery in each time period),
(5) The harvest rate in each fishery during each time period,
(6) The weekly catch contributions from each stock in each fishery (eg. the catch of each stock, and sub-stock, in a particular fishery for a given week).

Since the emphasis in this report is on the status of the fish stocks, rather than on the state of the fisheries, the results presented here are organized by fish stock. Outputs (1) and (2) above have been amalgamated into one table, while the entering run timing results for each stock have been averaged over the time frame of this analysis (1970-1982) to produce a composite timing curve, together with an indication of the variability in the timing, for even and odd-year runs separately. Whereas the run reconstruction process produces a single year's results for all stocks, these results have been rearranged in this report to display 1970-1982 data for each stock separately. In this section, we present annotated samples of the results described in this report.

The summary data table shown below depicts time series of total annual run, catch, escapement and harvest rate, along with the year-by-year proportions of the catch of the stock which are harvested in each fishery. Note that only fisheries impacting on the stock in question are represented in the table. In the first two figures below, the annual run, catch and escapement results, in even- and odd years respectively, are plotted for the period 1970-1982. For each stock, the scale is chosen appropriate to the overall size of that stock. (Hence one must be careful to note differences in the scales when comparing between stocks.)

The third figure deals with entering run timing. The even-year and odd-year timing curves represent unweighted averages of the appropriate annual timing curves produced for the given stock (where in a particular year entering timing curves for individual sub-stocks have been averaged, weighted by their respective run sizes for that year). Also shown are the medians for the averaged curves (ie. the time at which 50% of the total run has entered the system) and ranges for these medians (the minimum and maximum median times over the period 1970-1982). Taken together, this information provides a reasonable indication of average timing, and variability in that timing, for each stock.

Throughout this report even-year timing curves are shown as solid lines while odd-year curves are represented by a dashed line. The odd-year median mark and range of median values is consistently displayed above the corresponding even-year information, as shown. Note that there are 4 possible configurations for the median of the average timing curve and the spread in timing. These possibilities are: (i) the spread can be on both sides of the 'average', the spread can be entirely to times (ii) earlier than the average or (iii) later than the average, or (iv) there may be no spread at all (under the assumptions of the analysis).

STOCK : UPPER SKEENA

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH NATIVE	%CATCH A1 TRL	%CATCH A1 NET	%CATCH A2E	%CATCH A3XY	%CATCH AREA 4	%CATCH AREA 5	%CATCH NOYES	%CATCH C.FOX
1970	1237505	849909	387595	68.68	0.15	0.60	0.87	0.00	8.27	36.17	50.03	0.06	3.86
1971	1194466	453493	740972	37.97	2.01	1.69	2.36	0.09	8.91	77.69	5.42	0.48	1.34
1972	478656	250621	228036	52.36	0.35	1.36	0.78	0.00	24.68	35.40	34.86	0.51	2.05
1973	1122422	437123	685299	38.94	1.00	1.10	1.05	0.09	8.21	72.24	7.36	4.18	4.76
1974	97250	53898	43352	55.42	0.86	0.83	0.50	0.00	21.54	67.31	3.15	0.56	5.24
1975	1208031	356317	851714	29.50	0.85	1.56	2.22	0.33	14.27	62.58	14.34	1.11	2.73
1976	511816	192337	319479	37.58	4.32	0.11	0.14	0.00	8.68	46.71	31.58	1.72	6.74
1977	1859453	1353105	506348	72.77	0.53	0.75	0.52	0.05	28.58	59.78	4.56	1.42	3.82
1978	1238295	733635	504659	59.25	1.91	0.50	0.15	0.00	45.18	32.25	13.76	1.13	5.12
1979	511128	336593	174535	65.85	1.51	3.45	4.61	0.63	20.42	57.94	5.11	5.05	1.28
1980	727700	361128	366572	49.63	0.77	9.04	1.51	1.61	38.66	27.53	10.11	3.17	7.61
1981	1061125	677232	383893	63.82	1.13	2.87	4.28	0.47	17.31	66.53	0.55	3.85	3.00
1982	904895	401785	503110	44.40	6.40	1.03	0.38	1.72	18.28	57.43	6.40	3.67	4.69

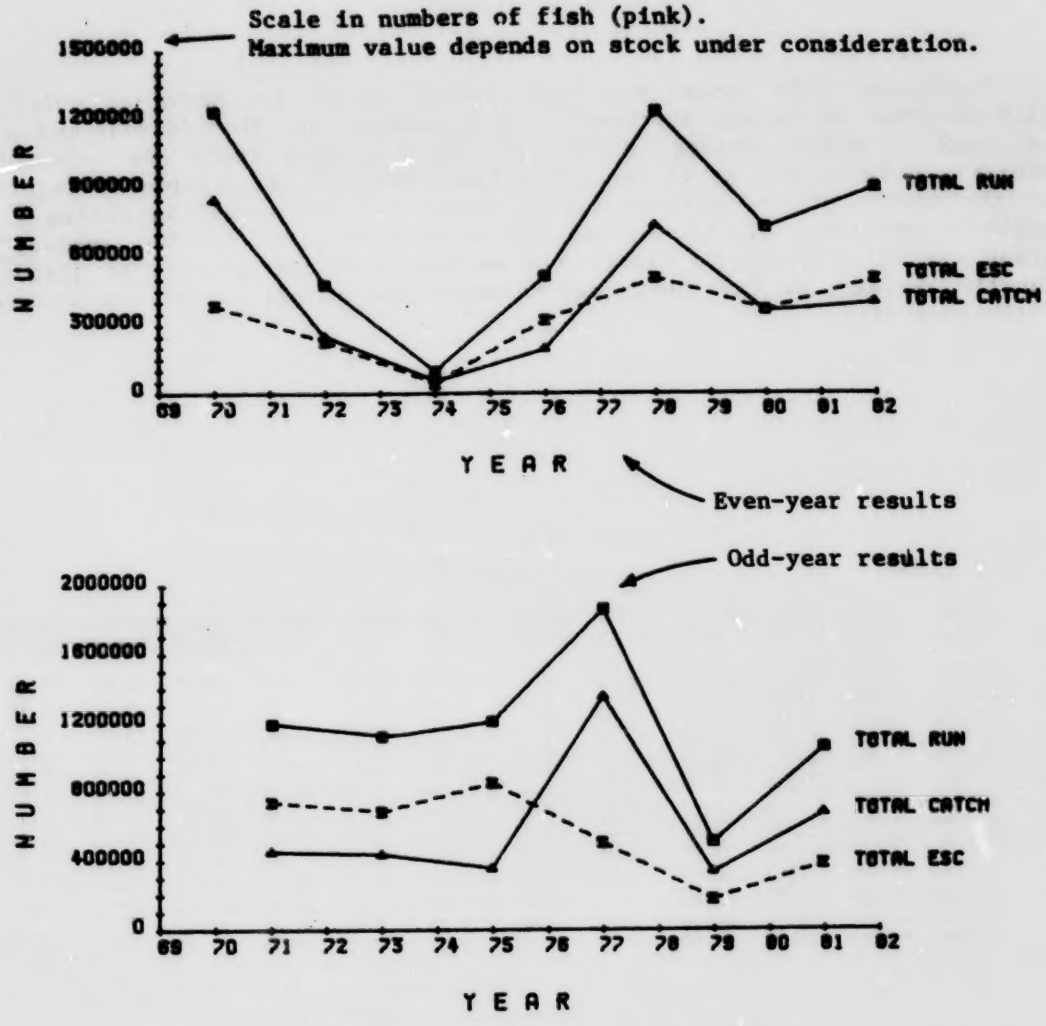
Harvest Rate

$$= \frac{\text{Total Catch}}{\text{Total Run}} \times 100\%$$

Percentage of total catch obtained in native food fishery (where relevant)

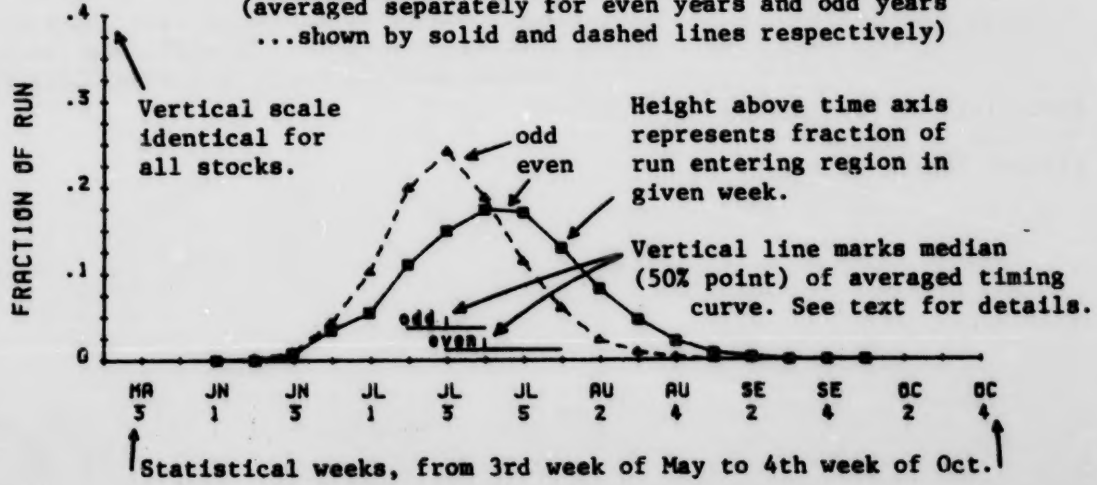
Fisheries of relevance to the "Upper Skeena" pink stock: native, Canadian commercial and U.S. commercial fisheries (i.e. Native, Area 1 Troll, Area 1 Net, Area 2E, Area 3X & 3Y, Area 4, Area 5, Noyes Island and Cape Fox).

Year-by-year Run, Catch and Escapement



Timing curve for "entering run" of given stock

(averaged separately for even years and odd years ...shown by solid and dashed lines respectively)



Data Sources

The following describes the primary sources for each input into the run reconstruction process, by geographical area.

Queen Charlotte Islands and North Coast

Catch:
(1) DFO Pacific Region Historical Salmon Commercial Catch Data System (Wong, 1982).
(2) Alaska Department of Fish and Game catch statistics (Noyes Island and Cape Fox catches)
(3) Annual 'Area Histories' (Native food fishery catches, Number of days open/week).
(4) 1982 North Coast Tagging Project (Gazey and Birdsall, 1983) and Field Services Branch (FSB) Management Biology estimates (for apportioning catch of interception fisheries into 'local' and 'non-local' components).

Escapement:
(1) Fishery officer estimates
(2) Stream catalogues
(3) FSB revised data
(4) B.C. Fish and Wildlife Department Skeena River analyses

Timing:
(1) Test fishery data
(2) Stream catalogues
(3) FSB biologist and fishery officer estimates
(4) B.C. Fish and Wildlife Department Skeena analyses

Migration Pattern:
(1) 1982 North Coast Tagging Project
(2) FSB biologist and fishery officer estimates

Central Coast

Catch:
(1) DFO Pacific Region Historical Salmon Commercial Catch Data System (Wong 1982)
(2) Annual "Area Histories" and Area Summaries (hail counts, number of days open/week)
(3) Central Coast Tagging Project (Aquatic Resources Ltd., 1980) and North Coast Tagging Project (Gazey and Birdsall, 1983) (for apportioning catch of interception fisheries into individual stock components)

Escapement:
(1) Stream catalogues
(2) FSB revised estimate
(3) Area 8 Workshop (1983)
(4) Fishery officer estimates

Timing:
(1) Commercial fishery C.P.U.E.
(2) Artnarko tower
(3) FSB biologist and fishery officer estimates
(4) Stream catalogues

Migration Pattern:
(1) Central Coast Tagging Study (1980)
(2) FSB biologist and fishery officer estimates

Queen Charlotte Islands

The Queen Charlotte Islands, made up of Graham Island on the north and Moresby Island to the south, are located between 80 and 150 kilometres off the north coast of British Columbia, separated from the mainland by Hecate Strait (Fig. 2). Prince of Wales Island in Alaska is due north of Graham Island across Dixon Entrance.

Pink salmon are the single most abundant salmonid species on the Queen Charlotte Islands. They are dominant in even years only, unlike North Coast stocks which have large runs on both odd and even year cycles. As with sockeye, the north, west and east coast of the Islands form natural stock aggregation areas, representing statistical areas 1, 2W and 2E respectively (Table 1).

Optimum even-year Pink escapement targets for these three stock aggregations, as published in the Fisheries and Oceans 1984 Commercial Fishing Guide, are for1million fish in Area 1, 750,000 in Area 2E and 500,000 in Area 2W. Recent returns, however, have been extremely poor and have been insufficient to meet escapement requirements even without any harvesting. All terminal fishing areas have been severely regulated with fisheries occurring only on well defined and identifiable surpluses. In recent years the only assured net fisheries on the Queen Charlottes have been the interception fisheries at Langara Island in Area 1 and Rennell Sound and Kano Inlet in Area 2W. The fisheries, primary gear types, and catch timing in the Area 1, Area 2W and Area 2E fisheries are shown in Table 2.

Very little is known of the migration routes of Queen Charlotte Islands stocks and their timing through other fisheries. For this study, fishery officer and management biologist estimates of these parameters have been used (Table 3).

It has been assumed that Area 1 pink stocks enter the study area at Noyes Island, pass through Dixon Entrance, and are impacted by the Area 1 net fishery for one or two time periods. Area 2W pink are assumed to follow one of two routes: (i) a north to south route past Noyes Island and Langara, or (ii) an approach from the west directly to Area 2W. Four possible routes have been used for Area 2E, three of which begin at Noyes Island while one avoids all fisheries except in the terminal area.

The use of 'proportion local' factors (Table 4), to isolate catch in each fishery that is due to Queen Charlotte Islands and North Coast pinks, is described in greater detail in the introduction to the North Coast analysis. Also discussed there are adjustments made to available catch statistics to account for delays in the reporting of troll catch and even greater delays in the case of freezer trollers.

Since the run timing and diversion rate inputs to the run reconstruction analysis cannot fully reflect year-to-year variability, and since the proportion local in the catch of each fishery can vary widely from one time period to the next, the model cannot always fully account for all catch in each fishery. Such 'unexplained' catches for each year of the analysis are shown in Table 5. Note that overall the proportion unexplained is quite low, although unexplained catch in Area 2E and Area 3Z can be significant in some years.

The combined Queen Charlotte Islands annual run, catch and escapement are shown in Fig. 3, for even- and odd-years separately over the period 1970-82. These results, obtaining by aggregating the Area 1, Area 2W and Area 2E stocks described below, indicate (i) a general decline in the even-year stock, (ii) diminishing odd-year escapements, and (iii) an increasing trend in odd-year catches.

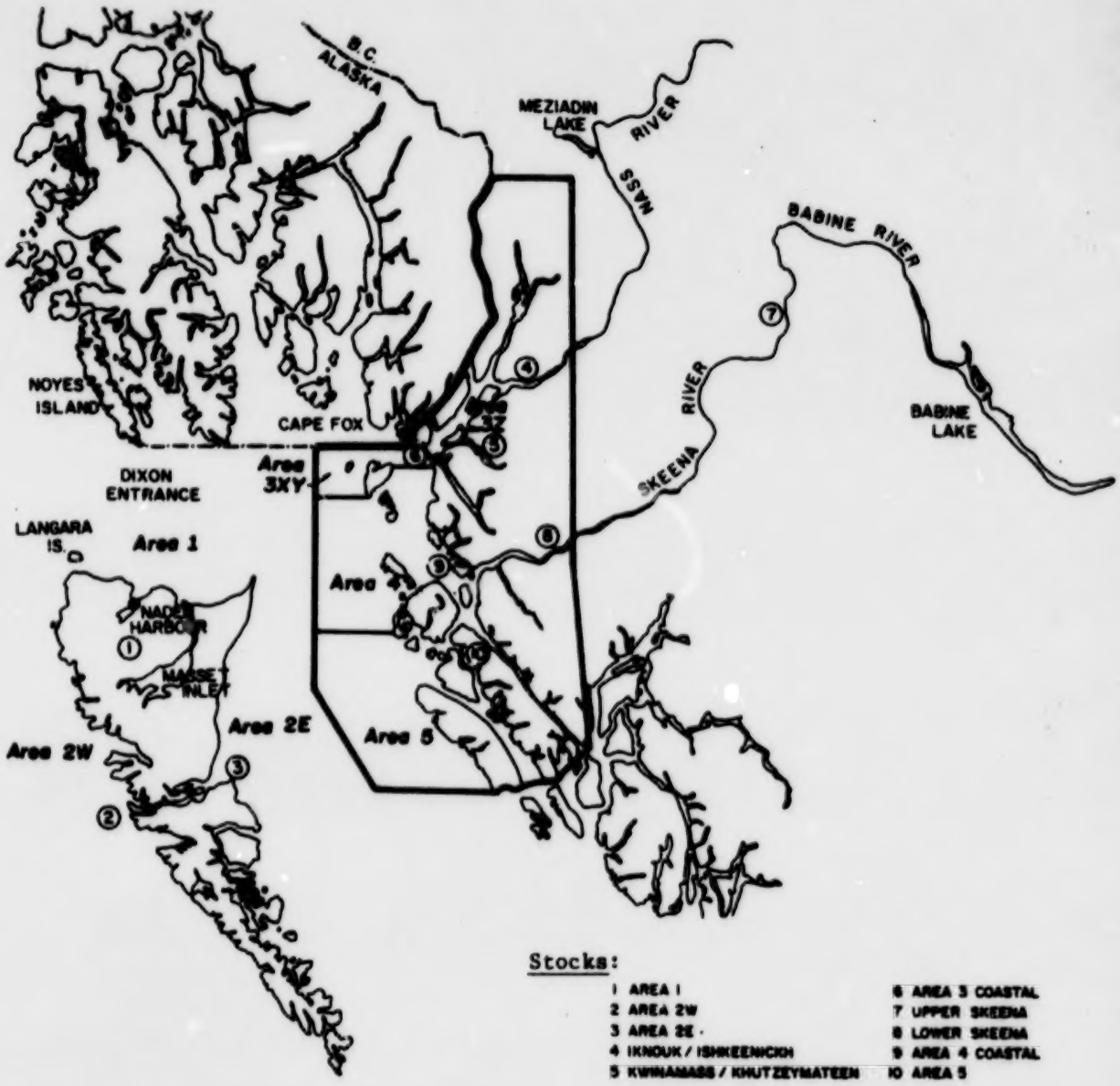


Fig. 2. The major pink salmon stocks (circled numerals) and pink salmon fisheries (boldface type) in the Queen Charlotte Islands / North Coast region.

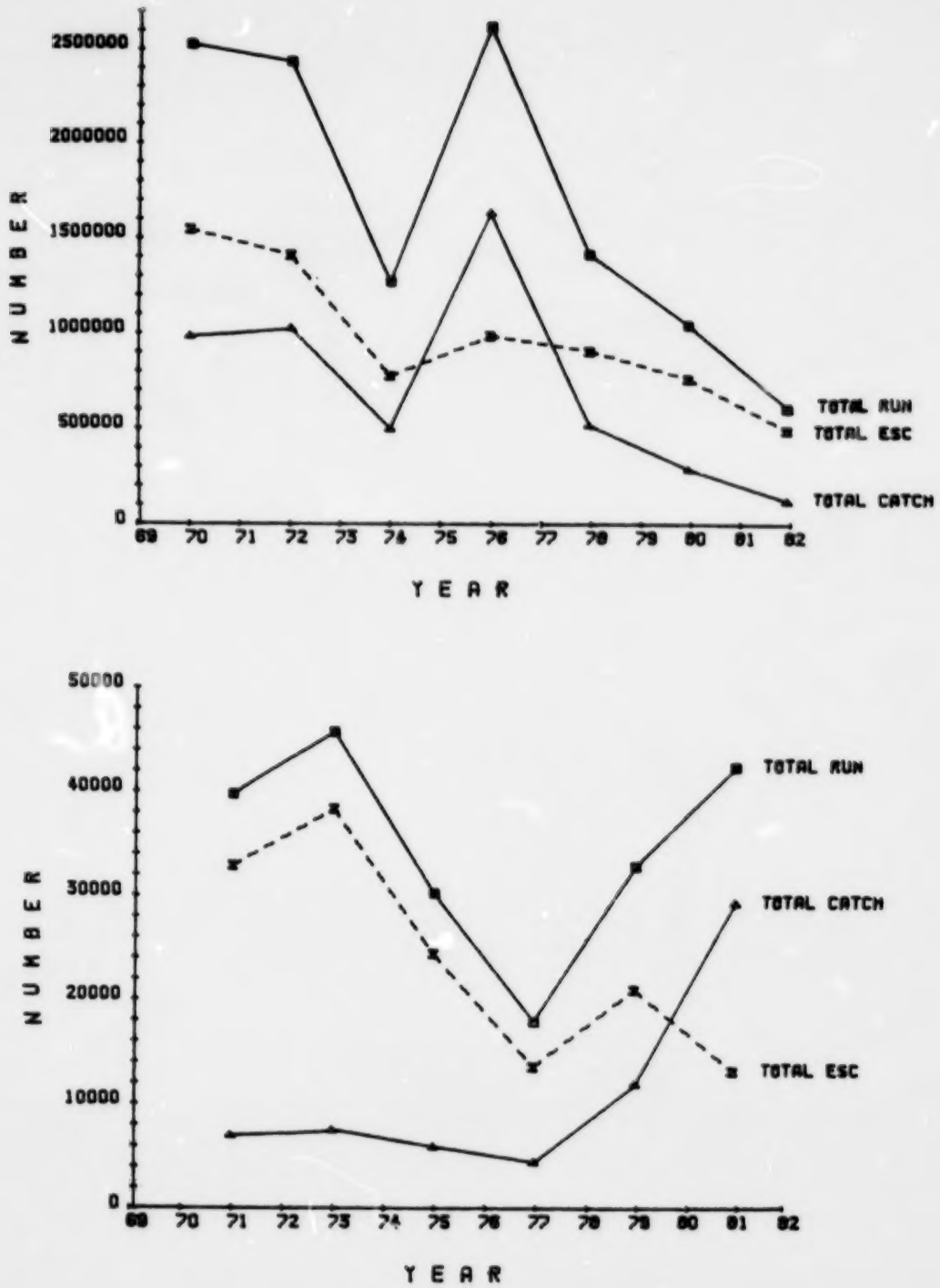


Fig. 3. Catch, escapement and total run size for even-year and odd-year Queen Charlotte Islands pink salmon stocks, 1970 to 1982.

Table 1. Stock groups and terminal area run timing for Queen Charlotte Island pink stocks.

	Escapement Timing		
Stock	Start	Peak	End
Area 1	early August	late August	mid September
Area 2W	late July	late August	mid September
Area 2E	early August	late August	mid September

Table 2. Gear type and pink catch timing in major commercial fisheries harvesting Queen Charlotte Islands pink stocks (fishery abbreviations in parentheses).

Fishery	Gear Type	Catch Timing		
		Start	Peak	End
Noyes Island, Alaska	seine	early July	late July-early August	late-August
Area 1 Troll (A1-T)	troll	late June	early August	early September
Area 1 Net (A1-N)	seine	early July	late July-early August	late August
Area 2W (A2W) (even years)	seine	late June	early-mid August	early September
Area 2E (A2E)	seine, troll	early July	late August	early September

Table 3. Migration routes and diversion rates for major Queen Charlotte Islands pink stock aggregations. (Migration time between fisheries is 1/2 week except 1 week where indicated by *)

Stock Name	Routing by Fishery	Proportion of Stock Utilizing each Route
Area 1	Noyes --> A1-T $\xrightarrow{*}$ --> A1-N --> esc.	0.25
	Noyes --> A1-T --> A1-N --> A1-N --> esc.	0.75
Area 2W	Noyes --> A1-T --> A1-N $\xrightarrow{*}$ --> A2W --> esc.	0.65
	A2W --> esc.	0.35
Area 2E	Noyes --> A1-T $\xrightarrow{*}$ --> A2E --> esc.	0.25
	Noyes --> A1-T --> A1-N --> A1-T $\xrightarrow{*}$ --> A2E --> esc.	0.35
	Noyes --> A1-T --> A1-N $\xrightarrow{*}$ --> A2W $\xrightarrow{*}$ --> A2E --> esc.	0.20
	A2E --> esc.	0.20

Table 4. Percentage of the catch in each pink fishery that is assumed to be of North Coast/Queen Charlotte Islands origin, by month.

	Fishery									
	A1-T	A1-N	A2W	A2E	A3XY	A3Z	A4	A5	Noyes	C. Fox
Even Years										
June	18	18	85	**	50	20	13	0	6	7
July	21	23	85	**	68	71	83	50	6	16
August	36	77	85	**	65	41	96	90	5	21
September	90	90	85	**	31	0	100	100	0	0
Odd Years										
June	50	60	0	40	60	70	95	0	10	9
July	50	60	0	40	80	90	95	40	10	20
August	65	85	0	40	80	90	95	70	8	26
September	100	100	0	40	100	100	100	90	0	0

** The percentage of the Area 2E catch assumed to be "local" is 100% for even years between 1970 and 1978 (when the terminal fishery dominates the catch) and 50% in 1980 and 1982 (when the Hecate Strait troll fishery dominates).

Table 5. Annual un-explained catch by fishery for Queen Charlotte Islands and North Coast pink fisheries.

	AREA 1 TROLL	AREA 1 NET	AREA 2W	AREA 2E	AREA 3XY	AREA 3Z	AREA 4	AREA 5	HOYES IS.	CAPE FOX	TOTAL UNEXPL	Z UNEXPL
1970	1620	3394	1857	29753	1492	15070	3773	169	0	1785	58913	1.75
1971	150	54	0	210	12	169	229	626	0	73	1523	0.11
1972	6170	5051	6020	27056	2636	7440	1569	5371	0	180	61493	1.82
1973	372	29	0	205	28	655	35	135	0	25	1484	0.15
1974	162	365	285	4796	30	4144	77	9	0	87	9955	0.96
1975	1488	14727	0	9	240	679	818	2	0	35	17998	1.90
1976	78	121	5658	11163	625	500	1955	1320	0	725	22145	0.90
1977	464	278	0	892	30	21000	284	41	0	80	23069	0.63
1978	864	313	4263	7027	276	26552	6619	1	0	921	46836	1.53
1979	70	0	0	93	2	141	0	287	0	0	593	0.05
1980	6875	3	11572	558	15	1512	0	1	0	113	20649	1.12
1981	3813	150	0	50	74	4824	5	4	0	13	8933	0.37
1982	648	0	5914	799	128	3387	9798	1213	0	710	22597	1.91

Area 1 Pink

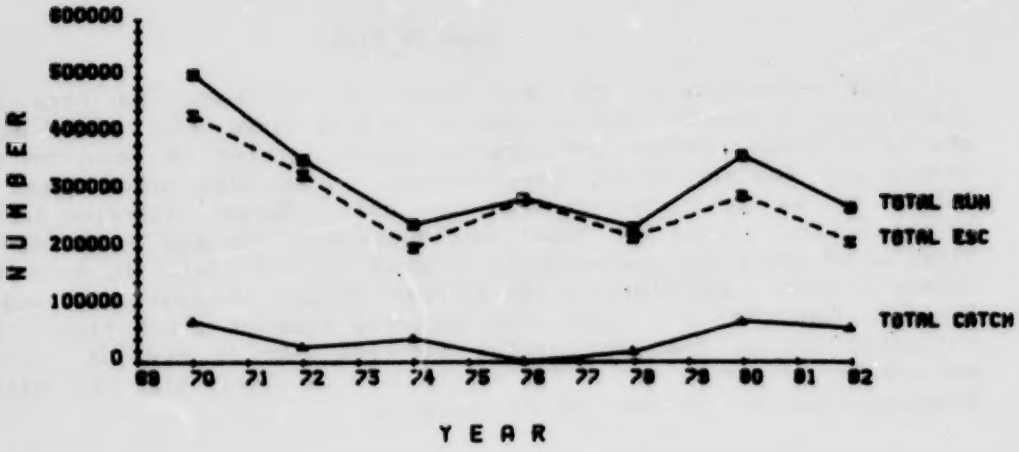
The Yakoun River on Massett Inlet is the largest pink producer in this area and the Queen Charlotte Islands as a whole. Escapements of over 1 million fish have been recorded in the past but recent levels have been less than one-third of that, with no commercial fisheries targeting on this stock. A 4 year research program to investigate the possible limiting factors to production in this system began two years ago and hopefully will eventually lead to a rehabilitation of this stock. The Langara Island net fishery undoubtedly intercepts pink salmon as does the Dixon Entrance troll fishery. The District 104 fishery centred around Noyes Island in Alaska is also thought to intercept these stocks, although the evidence for this assertion is limited to timing similarities between the catch and back dated escapements. Escapement estimates for the Yakoun pink stock were by fence counts until 1978. In 1980 a Peterson mark-recapture estimate was made and in 1982 only aerial and foot surveys were available. The other pink systems in this group are usually surveyed by air and foot only.

STOCK : AREA 1

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH A1 TRL	%CATCH A1 NET	%CATCH NOYES
1970	503942	71291	432651	14.15	1.13	96.31	2.56
1971	8400	2348	6052	27.95	9.37	48.96	41.67
1972	356144	26243	329901	7.37	5.97	23.65	70.38
1973	5185	1184	4001	22.83	14.70	32.42	52.88
1974	241938	40537	201401	16.76	4.81	66.20	28.99
1975	9115	5166	3949	56.68	10.94	89.06	0.00
1976	286325	1276	285049	0.45	3.06	0.00	96.94
1977	6966	2067	4899	29.68	12.26	62.03	25.71
1978	235851	18350	217501	7.78	5.07	1.04	93.89
1979	4537	1413	3124	31.14	50.22	44.34	5.44
1980	361426	70631	290795	19.54	40.27	21.31	38.42
1981	13660	10005	3655	73.24	17.65	28.57	53.78
1982	270241	58991	211250	21.83	2.46	0.18	97.36

The Area 1 even-year pink stock group shows no strong trends in run size, catch or escapement, although the large escapements of the early 1970s have not been repeated since. The much smaller odd-year system shows some decline in escapement but no noticeable trend in the highly-variable run size. Harvest rates on the Area 1 stock over the period 1970-82 have averaged 13% for even years and 40% for odd years (although the latter impact is not directed on this stock and is inflated by particularly high harvest rates in 1975 and 1981, when the odd-year stock was subject to relatively large, late catches). Of the three fisheries exploiting Area 1 pinks, the Area 1 troll fishery has had a small effect, except in 1980, while the Area 1 Langara net fishery and Noyes Island in Alaska have taken widely varying proportions of the catch, each ranging from 0% to 97%.

The entering run timing for Area 1 pinks at Noyes Island does not vary significantly between odd and even years, peaking in the second week of August.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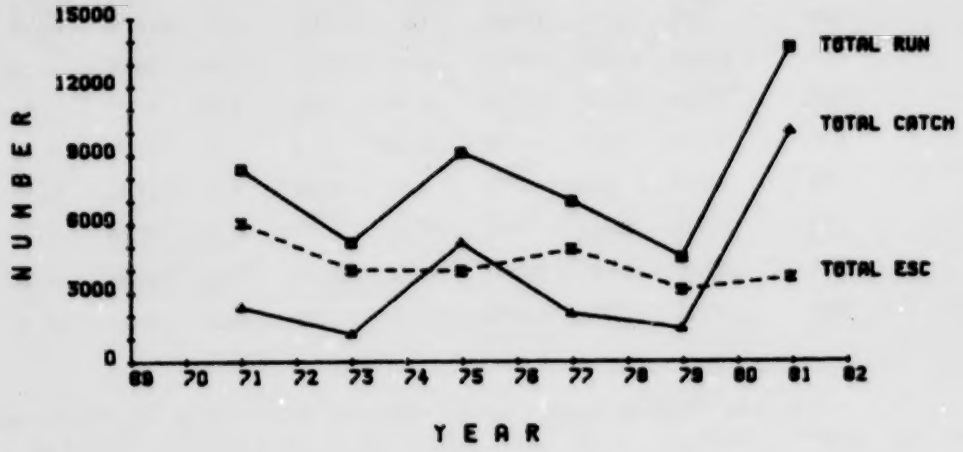
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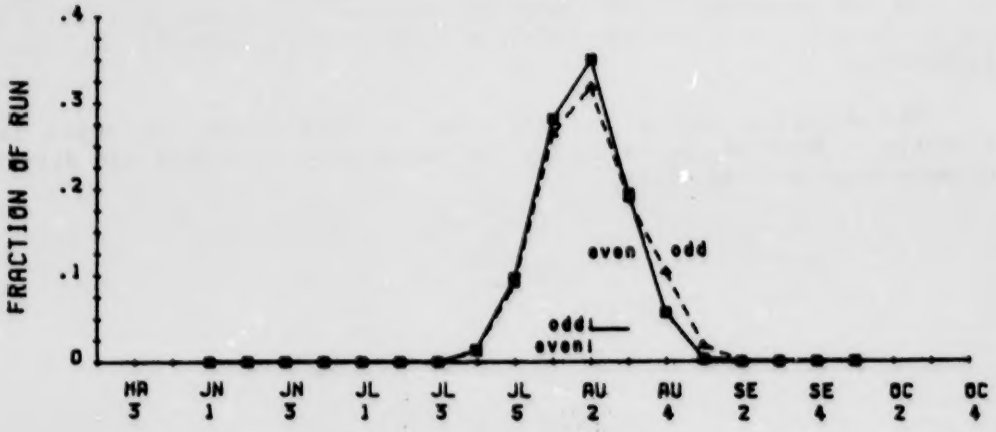
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Area 2W Pink

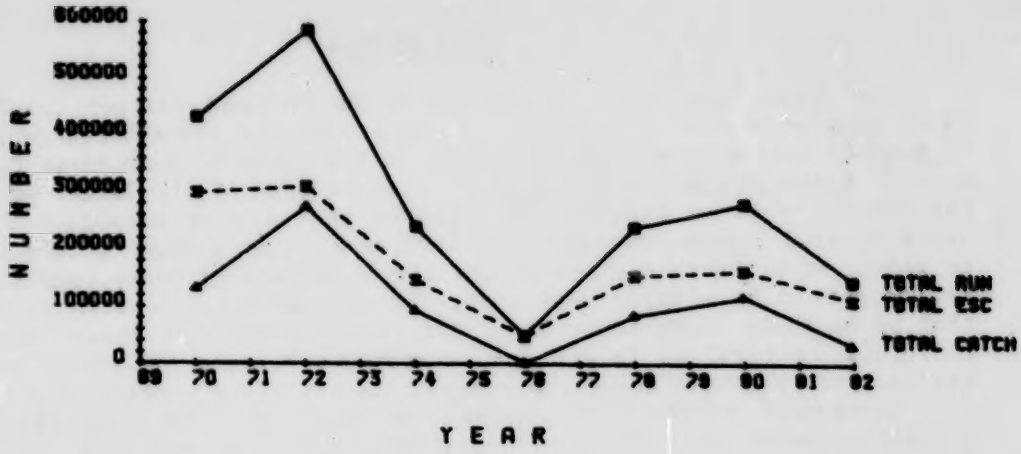
Pink production on the west coast of the Queen Charlotte Islands is distributed in coastal type streams in several large inlets. The major stocks are in Security, Kaisun and Bonanza Creeks located in Security and Kaisun Inlets and Rennell Sound, respectively. As with other Queen Charlotte Islands stocks these are even year runs only. Target fisheries occur only in terminal inlet areas, but these stocks are also thought to be intercepted in mixed stock net fisheries in Rennell Sound and Kano Inlet in Area 2W, Langara Island in Area 1 and District 104 at Noyes Island in Alaska. In addition, the Dixon Entrance troll fishery also harvests some of these fish. Escapement estimates are by foot and aerial surveys. As in Area 2E, environmental variability affecting egg to fry survival is extremely high with siltation and scouring from fall floods the main culprit.

STOCK : AREA 2W

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH A1 TRL	%CATCH A1 NET	%CATCH AREA 2W	%CATCH NOYES
1970	431828	132203	299625	30.61	0.53	10.94	88.00	0.54
1972	585934	275133	310801	46.96	0.49	3.54	92.34	3.64
1974	241168	93293	147875	38.68	1.13	5.07	82.96	10.85
1976	49974	2002	47972	4.01	0.02	4.01	64.00	31.97
1978	240776	85363	155413	35.45	0.77	0.39	90.50	8.34
1980	283685	118707	164978	41.84	13.14	7.52	64.80	14.54
1982	146225	33733	112492	23.07	1.43	0.82	35.66	62.09

Only even year results have been reported here for Area 2W stocks, as odd year escapement estimates are negligible or non-existent. The run, catch and escapement of even-year pink have declined since the early 1970s, although harvest rates, averaging 32% over the 1970-82 period, appear to be responsive to run size (i.e. reduced in poor years). Most of the catch of Area 2W pink is obtained terminally, but there has been an increasing proportion caught at Noyes Island; this effect counters conservation efforts in the terminal fisheries.

The entering timing for the Area 2W pink stock, at Noyes Island and directly to Area 2W, peaks during the first week of August and differs little between even and odd years.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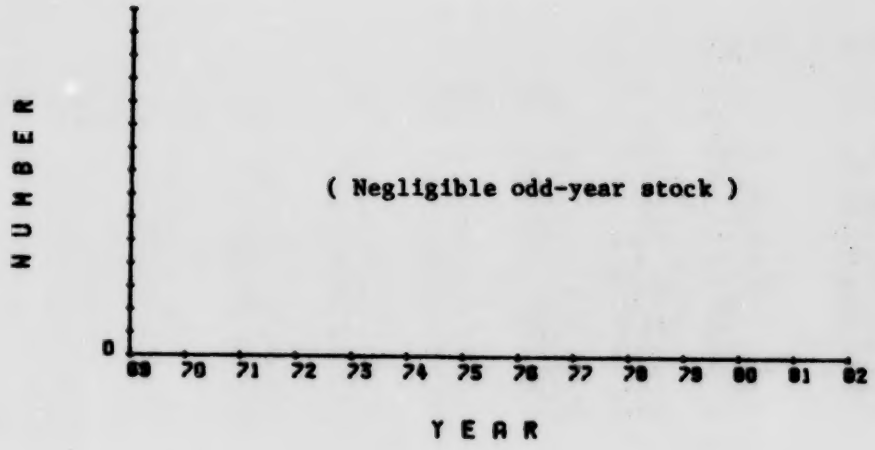
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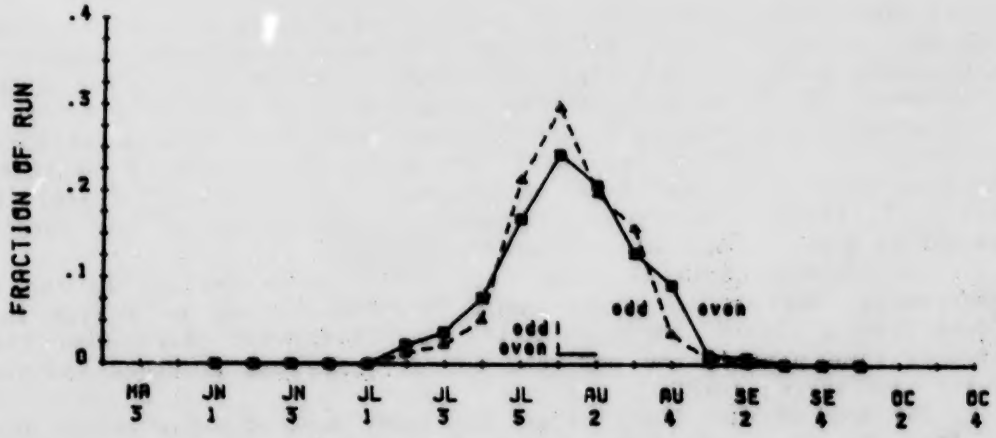
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Area 2E Pink

The Copper and Deena Rivers and Windy Bay and Pallant Creeks are the major pink producers in Area 2E. These stocks are distributed geographically on Morseby Island from Skidegate Inlet in the north to Juan Perez Sound in the south. Although these major stocks represent some of the larger watersheds on the Queen Charlotte Islands the majority of the pink producing systems are small coastal streams without lake reservoirs. As a result, they are subject to gravel scouring that often occurs during periods of heavy fall rains. This is thought to be a major reason for the extreme variations in survival rates that seems to be characteristic of this stock group. In-season monitoring of build-ups in terminal inlets and escapements becomes extremely important in systems such as these where pre-season forecasting is unreliable.

Escapement surveys are obtained by foot and fixed wing aircraft while migration route and timing information represents the best estimates by fishery officers and biologists using back-dated escapements and terminal harvest timing.

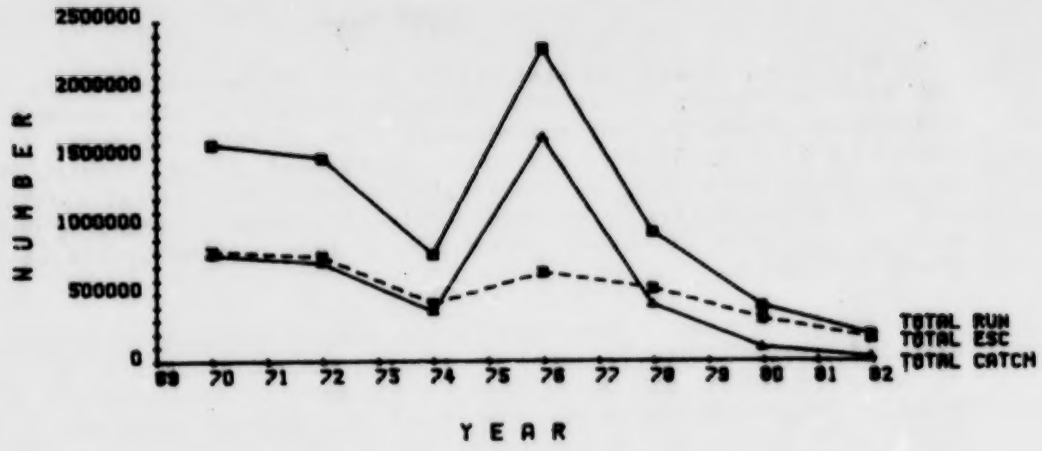
STOCK : AREA 2E

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH A1 TRL	%CATCH A1 NET	%CATCH AREA 2W	%CATCH AREA 2E	%CATCH NOYES
1970	1584143	775781	808362	48.97	0.37	5.15	19.78	74.32	0.38
1971	31209	4506	26703	14.44	18.13	32.23	0.00	6.24	43.40
1972	1487550	720596	766954	48.44	0.84	2.80	39.94	51.83	4.59
1973	40443	6223	34220	15.39	16.93	10.44	0.00	7.25	65.37
1974	781879	359606	422273	45.99	1.70	2.04	28.61	61.55	6.10
1975	21017	651	20366	3.10	23.95	20.28	0.00	55.42	0.36
1976	2278293	1628398	649895	71.47	0.01	0.00	0.24	99.31	0.44
1977	10850	2268	8582	20.90	16.70	22.14	0.00	22.99	38.17
1978	939315	408309	531006	43.47	0.98	0.21	27.77	61.75	9.30
1979	28208	10420	17788	36.94	36.68	38.13	0.00	15.45	9.74
1980	400065	94957	305108	23.74	37.82	10.80	17.35	3.87	30.16
1981	28621	19196	9423	67.08	17.06	10.52	0.00	7.16	65.26
1982	191747	24949	166798	13.01	3.61	0.85	3.70	2.57	89.27

As in the other Queen Charlotte Islands statistical areas, even year pinks predominate in Area 2E, but odd year stocks are also substantial. There has been a fairly steady decline in even-year escapements, together with a decreasing trend in run size and catch. It is interesting that a poor escapement in 1974 produced a very large return in 1976, but a high terminal harvest rate that year left an escapement lower than those experienced in the early 1970s. Since 1976, there has been a considerable decline in the terminal Area 2E harvest rate, as follows: 71% (1976), 27% (1978), 1% (1980) and 0.3% (1982). On the other hand, the proportion of the total harvest caught at Noyes Island has increased over time.

The odd-year Area 2E pink stock has shown a decline in run size and escapement, but an increasing trend in catch, driven by a rise in harvest rates from a 1971-75 average f 11% to 42% for 1977-81. Over the entire 1970-82 time period, the odd-year harvest rate has averaged 26% while even years have averaged 42%.

The Area 2E pink stock enters the study area at Noyes Island or directly to Area 2E. The peak in both odd and even years occurs on average the first week of August, although this can be delayed by one week.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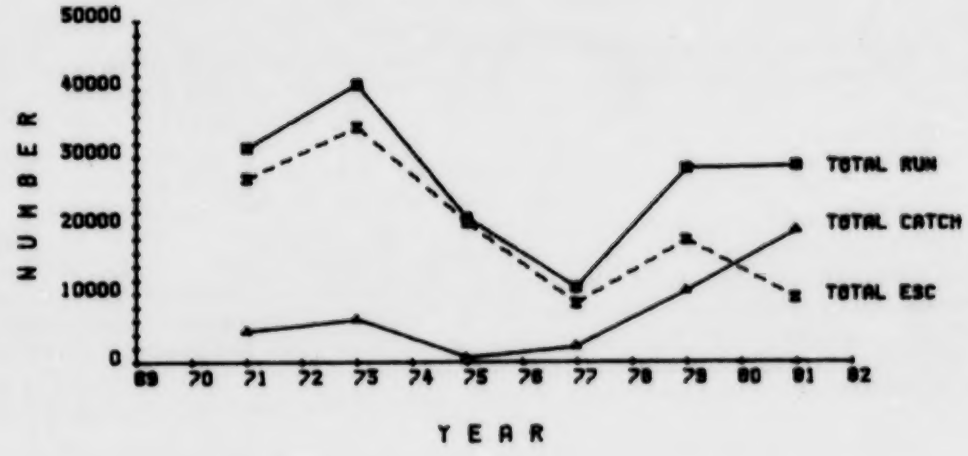
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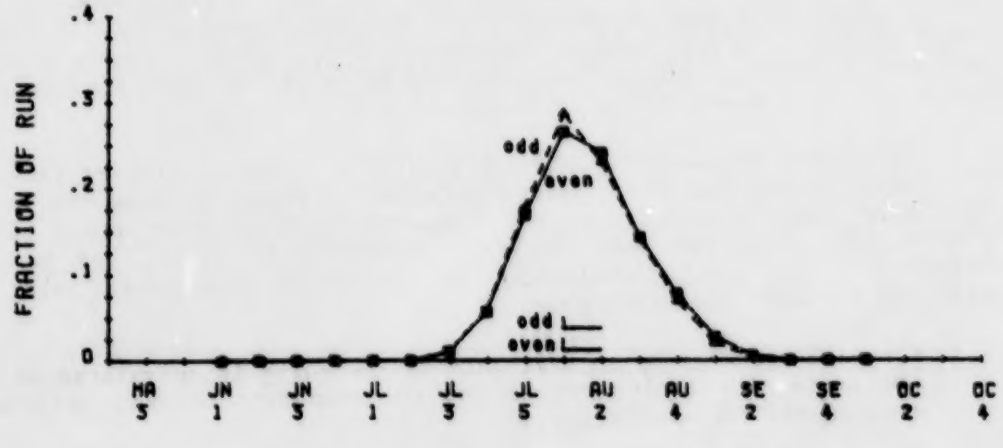
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North Coast

This area, comprising statistical areas 3-5, encompasses the drainages of the Nass and Skeena Rivers and the adjacent coastal area stretching from the U.S./Canada border to the southernmost tips of Pitt and Banks Islands. The Skeena and Nass Rivers are the second and third largest B.C. rivers respectively, with their entire length in B.C. The coastal portion of Area 3 and 4 is characterized by an outer chain of islands surrounding Chatham Sound, a large open body of water. Area 5 is a more complex series of islands and channels (Fig. 4).

Pink production on the north coast originates both in tributaries to the Nass and Skeena Rivers, as well as a large number of smaller coastal streams. Of the targeted annual North Coast escapement of approximately 1.5 million, roughly 70 percent spawn in the Nass and Skeena waterbeds. Major pink producing tributaries on the Nass are the Iknouk and Ishkeenickh while the Lakelse, Kispiox, Kitwanga and Babine are the major Skeena pink producing tributaries. In addition river spawning stocks, which are very difficult to assess, are found in the mainstem of the Nass and Skeena.

The pink stocks in Area 3 have been divided into three aggregations for the purpose of this study, according to geographical and timing differences (Table 6). The Iknouk/Ishkeenickh group is comprised of the two pink producing tributaries of the Nass River. The Khutzeymateen/Kwinamass group includes the two large coastal rivers as well as Dogfish Creek, another major coastal pink stream. These two groups have a similar run timing, peaking in the first week of August (odd years) or the second week of August (even years). Finally, the Area 3 Coastal group, made up of smaller coastal systems, is treated as a 'remainder' stock, and is assumed to peak about three weeks later than the other two Area 3 stocks. Escapement data used for these stock aggregations represent the most precise estimates available; where possible, original fishery officer estimates have been used in place of the mid-points of escapement ranges that were often used in the early 1970s.

Three pink stock aggregations have also been identified in Area 4. These groups are again differentiated by geography and timing. The Upper Skeena group is composed of the Kispiox, Kitwanga, Babine and Bulkley stocks, each of which are found more than 150 km. from the mouth of the Skeena. The Lower Skeena group includes the Skeena River mainstem spawners (all < 150 km. from the mouth), the Lakelse River (the major pink producer in the entire Skeena drainage) and all remaining Skeena pink producers (most of which are located in the lower Skeena area).

The Upper Skeena group peaks through the terminal fishery in late July - mid August while the Lower Skeena aggregation tends to peak one week later. Typically both Skeena stocks are somewhat later in even years than in odd years. To allow for year to year variations in timing and to allow for differences in annual abundances of the stock components, the following approach has been used each year:

(1) for each stock group an aggregate timing curve is calculated by averaging the respective timing curves for the component stocks, weighted by the escapements for each stock.

(2) an overall Skeena timing curve is determined by averaging the Upper Skeena and Lower Skeena timing, weighted by the total escapement for each stock aggregation.

(3) the timing curves for Upper and Lower Skeena stocks are shifted so that the peak of the overall Skeena timing agrees with the peak of the Skeena test fishery results.

The timing shifts necessary to correct for annual variations, and the resulting timing peaks for Upper Skeena and Lower Skeena stocks, are shown in Table 7.

The Area 4 Coastal streams make up the last Area 4 group; this group has the latest timing, peaking in the third week of August. Escapements for each stock aggregation were calculated by summing the appropriate stock-by-stock escapement values recorded in the North Coast Management Biology Unit.

For the purpose of this study, all Area 5 pink stocks have been aggregated into one group, peaking in the fourth week of August.

North Coast pink stocks approach their respective terminal areas from the north and west via Hecate Strait, Dixon Entrance and southeast Alaska. From past tagging and catch data, a more westerly approach is evident in even years while a northerly approach is predominant in odd years.

Major fisheries which impact on these stocks are located at Noyes Island and Cape Fox in Alaska, Langara Island and Dixon Entrance off the north coast of the Queen Charlotte Islands, and in the more terminal areas in Areas 3, 4 and 5 (Table 8). Seines are the most effective gear for capturing pink salmon and by far the largest proportion of the catch is by this gear type. In recent years, trollers have also become effective in harvesting pink salmon, particularly in Dixon Entrance. Troll catch of pink salmon tends to be brought into port (and hence reported) on average 1/2 week after it is caught. In addition, freezer troll catch, increasingly prevalent since 1978, is subject to even longer delays between actual landing and eventual reporting of the catch. To account for these effects, troll catch statistics for Dixon Entrance (Area 1) and Hecate Strait (Area 2E) have been shifted forward by 1/2 week, and freezer troll catches have been re-distributed over the fishing season in proportion to non-freezer troll catch.

All of the above fisheries harvest Alaska-bound pink stocks to some degree. Interception of pink stocks by Alaska and Canada in the northern boundary area is one of the major issues in the negotiations towards an international agreement that have taken place over the last twenty years. Annual variations in relative run strengths, migration routes and timing and the lack of reliable stock identification techniques has made progress in this area difficult. In this analysis, an attempt has been made to isolate the 'study area' (North Coast plus Queen Charlotte Islands) catch component in each fishery, using 'proportion local' factors (Table 9) drawn from results of the North Coast Tagging Project (Gazey and Birdsall, 1983) and from management biologist estimates.

Each Area 3 pink stock is assumed to split between three migration routes through the fisheries before reaching the spawning grounds. The 3 routes

represent northern, central and southern approach routes, entering the study area at Cape Fox, Noyes Island and Langara (Area 1) respectively. Diversion rates between these routes differ between odd and even years; tending toward more southerly approaches in even years (Table 10) and northerly routes in odd years (Table 11).

Three migration routes have also been delineated for Area 4 stocks, but different sets of routes have been used for even and odd years. In even years, stocks enter the region at Noyes Island, Langara and Area 5 (or Area 2E in 1980 and 1982, when Hecate Strait troll catch dominates the Area 2E catch). In odd years, pink stocks are assumed to enter at Cape Fox (arriving from Clarence Strait), Noyes Island and, to a lesser extent, the Area 2E Hecate Strait troll fishery.

Migration routes for Area 5 pink salmon are assumed to be similar to those used for Area 4 (even year) stocks, but with diversion rates reflecting more southerly approaches (Tables 10, 11). It should be noted in particular that the Area 4 fishery impacts on Area 5 stocks, and vice versa. In certain years, the Hecate Strait (Area 2E) fishery impacts on both Area 4 and Area 5 stocks, while the 'outer fisheries' at Noyes Island, Dixon Entrance (Area 1 troll) and Langara (Area 1 net) impact on all North Coast stocks each year.

As described in the introduction to the Queen Charlotte Islands analysis, year-to-year variability in timing, diversion rates and proportion local in each fishery leads to 'unexplained catch' occurring to various degrees in the analysis. These unaccounted for catches, which produce discrepancies between the catch figures used here and those found in the published catch statistics, are shown in Table 12.

The aggregated run, catch and escapement results for the North Coast (Areas 3-5), obtained by summing the 7 stock aggregations described below, are shown in Fig. 5. No significant trends are evident in either the even-year or the odd-year results.

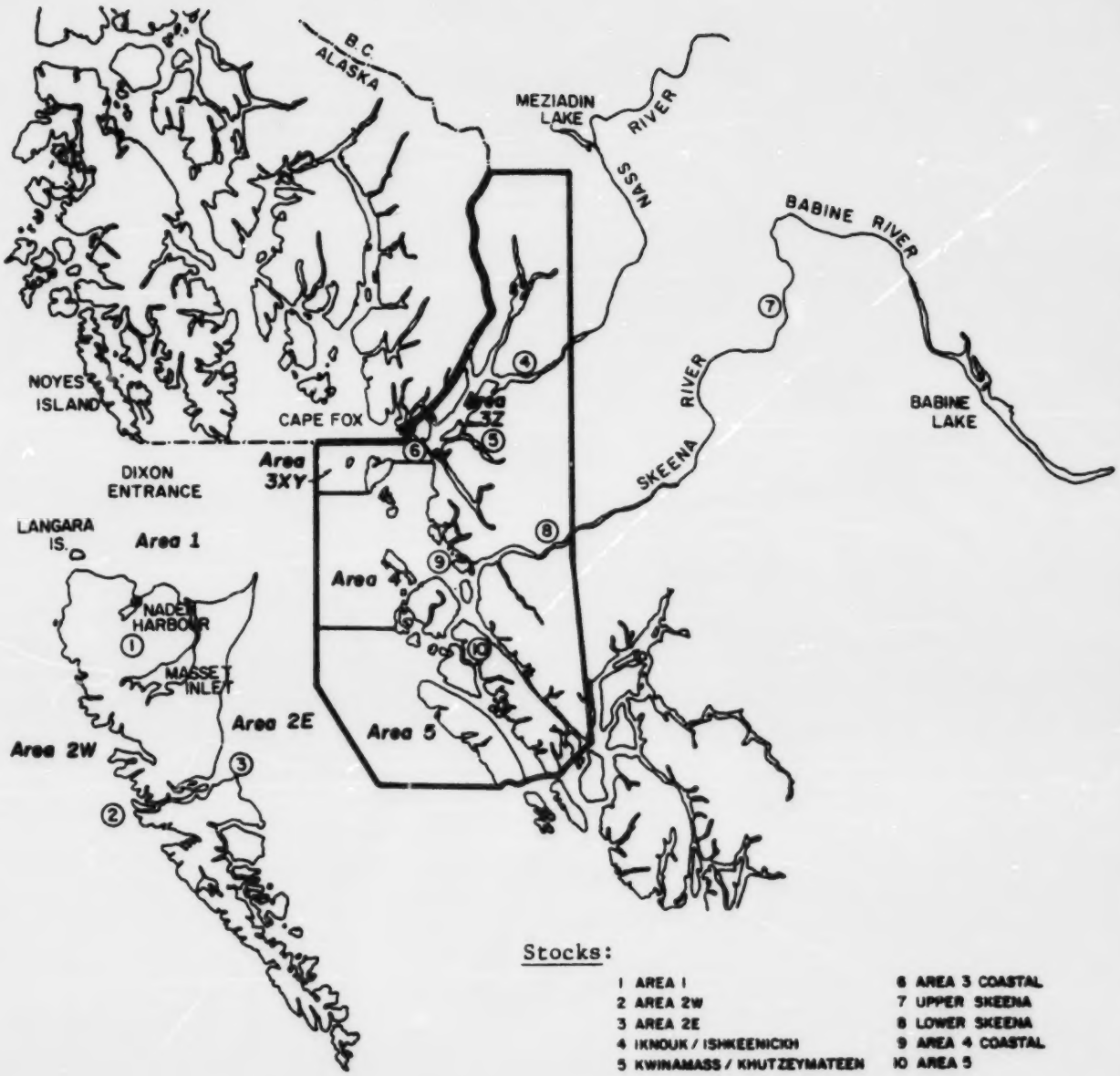
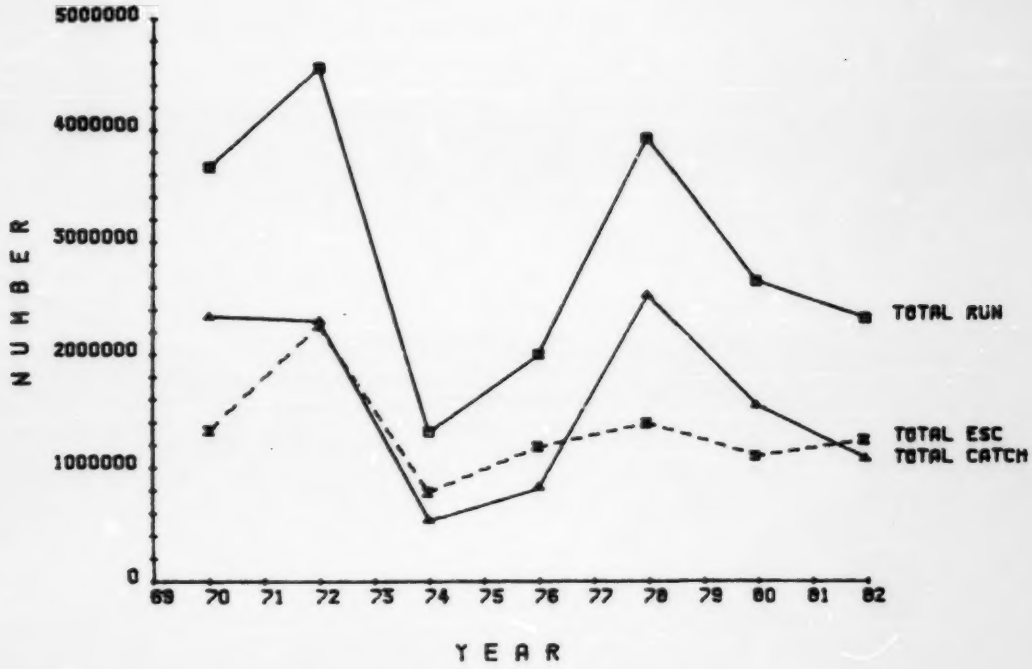


Fig. 4. The major pink salmon stocks (circled numerals) and pink salmon fisheries (boldface type) in the Queen Charlotte Islands / North Coast region.



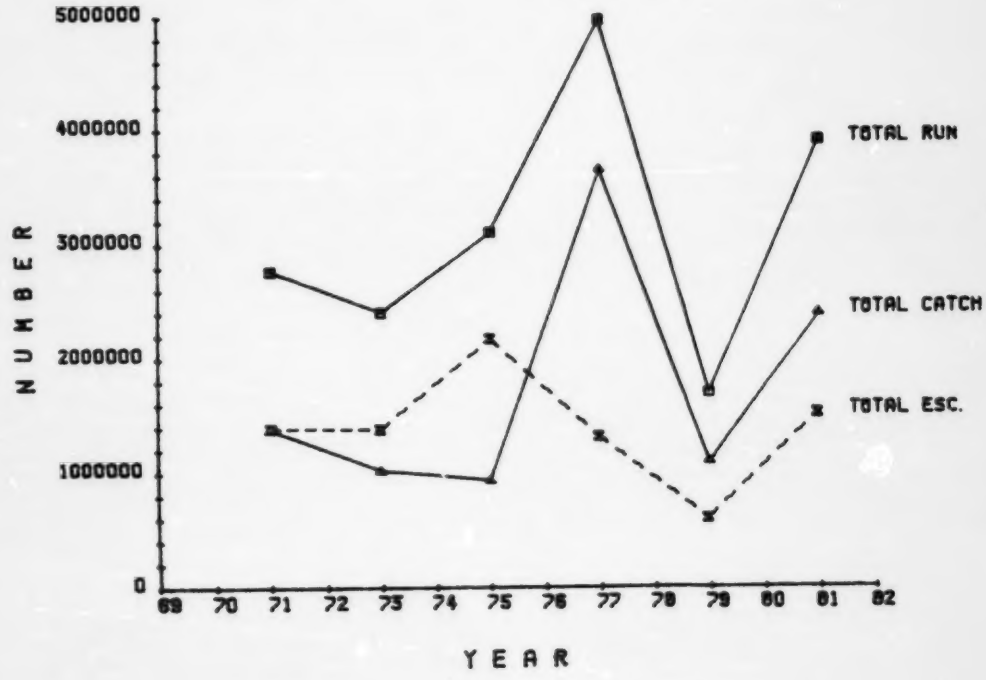


Fig. 5. Catch, escapement and total run size for even-year and odd-year North Coast pink salmon stocks, 1970 to 1982.

Table 6. Stock groups and terminal area run timing for North Coast pink stocks.

Stock		Escapement Timing		
		Start	Peak	End
Area 3 Iknouk/Ishkeenickh	(even)	mid July	2nd week August	early September
	(odd)	mid July	1st week August	early September
Area 3 Khutzeymateen/Kwinamass	(even)	mid July	2nd week August	early September
	(odd)	mid July	1st week August	early September
Area 3 Coastal	(even)	early August	1st week September	late September
	(odd)	early August	4th week August	late September
Area 4 Upper Skeena	(even)	early July	late July-mid Aug.	early September
	(odd)	early July	late July-early Aug.	early September
Area 4 Lower Skeena	(even)	late July	mid August	mid September
	(odd)	mid July	early-mid August	late Aug-mid Sept.
Area 4 Coastal	(even)	late July	3rd week August	mid September
	(odd)	late July	3rd week August	mid September
Area 5	(even)	mid August	late August	mid September
	(odd)	early August	late August	mid September

Table 7. Annual timing shifts and resulting peak timing for Skeena pink stocks.

Year	Shift required in calculated timing curves	Upper Skeena peak (statistical week)	Lower Skeena peak (statistical week)
1970	No change	Aug-1	Aug-2
1971	No change	Aug-1	Aug-2
1972	Later 1/2 week	Aug-1,2	Aug-2,3
1973	Later 1/2 week	Aug-1,2	Aug-2,3
1974	Earlier 1/2 week	July-5, Aug-1	Aug-1,2
1975	No change	Aug-1	Aug-2
1976	Later 2 weeks	Aug-3	Aug-4
1977	No change	Aug-1	Aug-2
1978	No change	Aug-1	Aug-2
1979	Earlier 1 1/2 weeks	July-4,5	July-5, Aug-1
1980	Earlier 1/2 week	July-5, Aug-1	Aug-1,2
1981	Earlier 1 week	July-5	Aug-1
1982	Later 1 week	Aug-2	Aug-3

Table 8. Gear type and sockeye catch timing for the major fisheries harvesting North Coast pink stocks.

Fishery	Gear Type	Catch Timing		
		Start	Peak	End
Noyes Island, Alaska	seine	early July	late July-early Aug.	late August
Cape Fox, Alaska	seine	late June	late July-mid Aug.	late August
Area 1 Troll (A1-T)	troll	late June	early August	early Sept.
Area 1 Net (A1-N)	seine	early July	late July-early Aug.	late August
Area 2E (A2E)	troll	early July	late July-mid Aug.	early Sept.
Area 3X,3Y (A3XY)	seine, gillnet	early July	late July-early Aug.	early Sept.
Area 3Z (A3Z)	seine, gillnet	early July	late July	late August
Area 4 (A4)	seine, gillnet	early July	early August	early Sept.
Area 5 (A5)	seine, gillnet	early July	early-mid August	early Sept.

Table 9. Percentage of the catch in each pink fishery that is assumed to be of North Coast/Queen Charlotte Islands origin, by month.

	Fishery									
	A1-T	A1-N	A2W	A2E	A3XY	A3Z	A4	A5	Noyes	C. Fox
Even Years										
June	18	18	85	**	50	20	13	0	6	7
July	21	23	85	**	68	71	83	50	6	16
August	36	77	85	**	65	41	96	90	5	21
September	90	90	85	**	31	0	100	100	0	0
Odd Years										
June	50	60	0	40	60	70	95	0	10	9
July	50	60	0	40	80	90	95	40	10	20
August	65	85	0	40	80	90	95	70	8	26
September	100	100	0	40	100	100	100	90	0	0

** The percentage of the Area 2E catch assumed to be "local" is 100% for even years between 1970 and 1978 (when the terminal fishery dominates the catch) and 50% in 1980 and 1982 (when the Hecate Strait troll fishery dominates).

Table 10. Migration routes and diversion rates for major North Coast even-year pink stock groups. (Migration time between fisheries is 1/2 week except 1 week where indicated by *)

Stock Name	Routing by Fishery	Proportion of Stock Utilizing each Route
Area 3 Iknouk/Ishkeenickh Area 3 Khutzeymateen/Kwinamass Area 3 Coastal		
	Cape Fox --> A3XY -->A3Z --> esc.	0.15
	Noyes --> A1-T -*-> A3XY -->A3Z --> esc.	0.30
	A1-N --> A1-T -*-> A3XY --> A3Z --> esc.	0.55
Area 4 Upper Skeena Area 4 Lower Skeena Area 4 Coastal		
	Noyes --> A1-T --> Cape Fox --> A3XY --> A4 --> esc.	0.20
	A1-N --> A1-T -*-> A4 --> esc.	0.40
	(A2E)[1] --> A5 --> A4 --> esc.	0.40
Area 5		
	Noyes --> A1-T -*-> A4 --> A5 --> esc.	0.15
	A1-N --> A1-T -*-> A5 --> esc.	0.40
	(A2E)[1] --> A5 --> esc.	0.45

(1) Area 2E is included in these routings only in 1980 and 1982, when the Area 2E catch was troll-dominated.

Table 11. Migration routes and diversion rates for major North Coast odd-year pink stock groups. (Migration time between fisheries is 1/2 week except 1 week where indicated by *)

Stock Name	Routing by Fishery	Proportion of Stock Utilizing each Route
Area 3 Iknouk/Ishkeenickh Area 3 Khutzeymateen/Kwinamass Area 3 Coastal		
	Cape Fox --> A3XY -->A3Z --> esc.	0.35
	Noyes --> A1-T -*-> A3XY -->A3Z --> esc.	0.30
	A1-N --> A1-T -*-> A3XY --> A3Z --> esc.	0.35
Area 4 Upper Skeena Area 4 Lower Skeena Area 4 Coastal		
	Cape Fox --> A3XY --> A4 --> esc.	0.30
	Noyes --> A1-T --> A1-N -->A1-T -*-> A4 --> esc.	0.60
	A2E --> A5 --> A4 --> esc.	0.10
Area 5		
	Noyes --> A1-T -*-> A4 --> A5 --> esc.	0.50
	A1-N --> A1-T -*-> A5 --> esc.	0.35
	A2E --> A5 --> esc.	0.15

Table 12. Annual unexplained catch by fishery for Queen Charlotte Islands and North Coast pink fisheries.

	AREA 1 TROLL	AREA 1 NET	AREA 2W	AREA 2E	AREA 3XY	AREA 3Z	AREA 4	AREA 5	HOYES IS.	CAPE FOX	TOTAL UNEXPL	% UNEXPL
1970	1620	3394	1857	29753	1492	15070	3773	169	0	1785	58913	1.75
1971	150	54	0	210	12	169	229	626	0	73	1523	0.11
1972	6170	5051	6020	27056	2636	7440	1569	5371	0	180	61493	1.82
1973	372	29	0	205	28	655	35	135	0	25	1484	0.15
1974	162	365	285	4796	30	4144	77	9	0	87	9735	0.96
1975	1488	14727	0	9	240	679	818	2	0	35	17998	1.90
1976	78	121	5658	11163	625	500	1955	1320	0	725	22145	0.90
1977	464	278	0	892	30	21000	284	41	0	80	23069	0.63
1978	864	313	4263	7027	276	26552	6619	1	0	921	46836	1.53
1979	70	0	0	93	2	141	0	287	0	0	593	0.05
1980	6875	3	11572	558	15	1512	0	1	0	113	20649	1.12
1981	3813	150	0	50	74	4824	5	4	0	13	8933	0.37
1982	648	0	5914	799	128	3387	9798	1213	0	710	22597	1.91

Iknouk/Ishkeenickh Pink

The Iknouk and Ishkeenickh are tributaries of the Lower Nass River and support predominantly odd year runs of pink salmon. The spawning escapements in these systems are very difficult to assess due to the large size and turbidity of the rivers, and this no doubt has contributed to the variability in escapement estimates. In-season management of this stock group is determined by the evaluation of catch per unit effort in Portland Inlet, a mixed stock terminal fishing area, and weekly aerial escapement monitoring surveys. In an average "even year", the Iknouk/Ishkeenickh stock escapes the terminal fishing area beginning in mid-July, peaking the second week of August, and ending in early September. The escapement in "odd years" appears to be shifted forward in time by one week, with a peak in the first week of August, although the range of timing is taken to be as for even years. This group, like all Area 3 pink stocks, is caught in fisheries at Noyes Island, Dixon Entrance, Langara Island, Cape Fox and in sub-areas 3X, 3Y and 3Z.

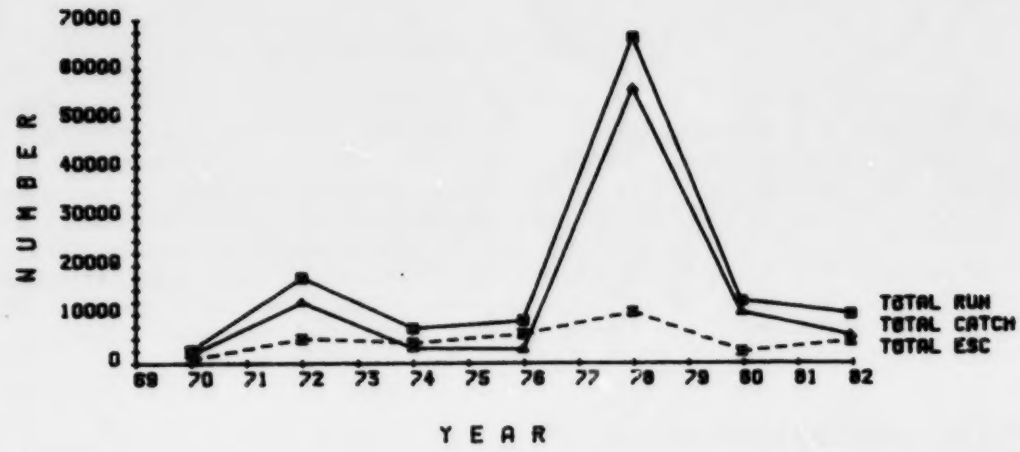
STOCK : IKNOUK/ISHKEENICKH

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH NATIVE	%CATCH AI TRL	%CATCH AI NET	%CATCH AR 3XY	%CATCH AR 3Z	%CATCH NOYES	%CATCH C.FOX
1970	2764	1908	856	69.03	0.72	0.78	2.50	30.13	63.07	0.08	2.71
1971	35579	12077	23502	33.94	2.34	1.21	1.99	42.80	50.35	0.13	1.18
1972	17659	12561	5098	71.13	0.10	0.84	4.09	33.26	60.12	0.65	0.95
1973	37360	26355	11005	70.54	0.61	0.25	0.40	8.11	85.63	1.99	3.01
1974	7161	3010	4150	42.04	1.51	0.91	3.90	30.58	54.65	1.10	7.34
1975	48682	10688	37993	21.95	9.42	0.70	1.58	64.38	20.69	0.71	2.52
1976	8723	2724	6000	31.22	2.95	0.00	0.84	85.29	4.18	3.12	3.61
1977	820186	710186	110001	86.59	0.21	0.35	0.17	25.51	67.37	1.57	4.84
1978	66705	56205	10499	84.26	0.04	0.21	0.14	40.61	56.82	0.46	1.72
1979	34429	16926	17503	49.16	5.48	4.30	7.33	58.09	17.74	5.66	1.41
1980	12715	10317	2398	81.14	0.33	7.52	1.45	39.97	42.59	2.34	5.81
1981	265286	175281	90005	66.07	0.45	2.71	6.66	24.77	54.67	7.27	3.47
1982	10109	5609	4500	55.48	0.32	0.80	0.61	45.46	49.30	1.54	1.98

The Iknouk/Ishkeenickh stock aggregation is principally an odd-year group. For odd years, there is no clear trend in escapement, but 1977 and 1981 were particularly good years so an increasing trend could be postulated; this is reflected in run size as well. There are no trends apparent in the even-year stock.

Harvest rates over the period 1970-82 have averaged 62% for even years and 55% for odd years. Very high harvest rates are shown for 1977, 1978 and 1980. This could reflect actual heavy fishing pressure, or could be due to either (i) shifts in run timing unaccounted for by the reconstruction analysis, or (ii) an unusually large component of non-local (i.e. Alaskan) fish in the Area 3 catch. It does not appear possible to fully explain these harvest rates, although there is evidence that in 1980 heavy fishing effort was largely responsible.

Since timing and migration route inputs for this stock are identical to those of the Area 3 Khutzeymateen/Kwinamass stock, so too are the fishery by fishery catch proportions. The latter are discussed in detail under the Khutzeymateen/Kwinamass analysis. The average median for entering run timing, at Cape Fox, Noyes Island and Langara, occurs during the fourth week of July, although the average peak during odd years is one week earlier.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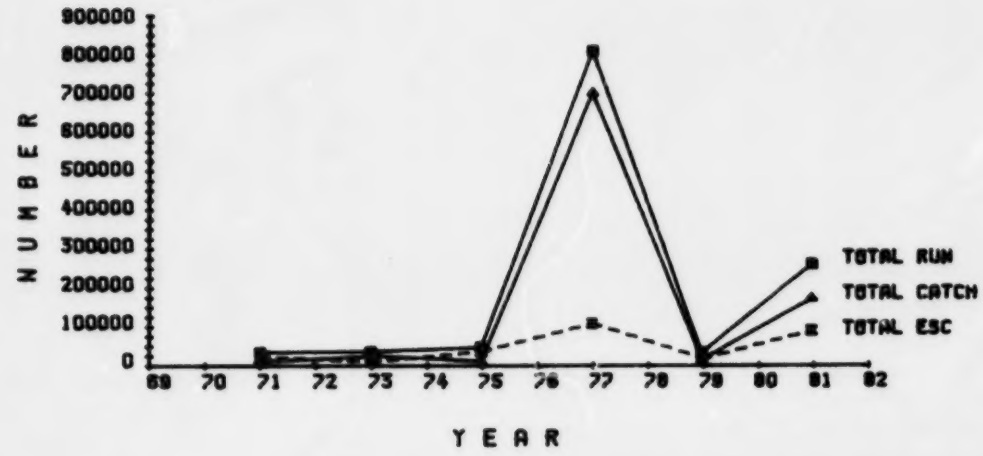
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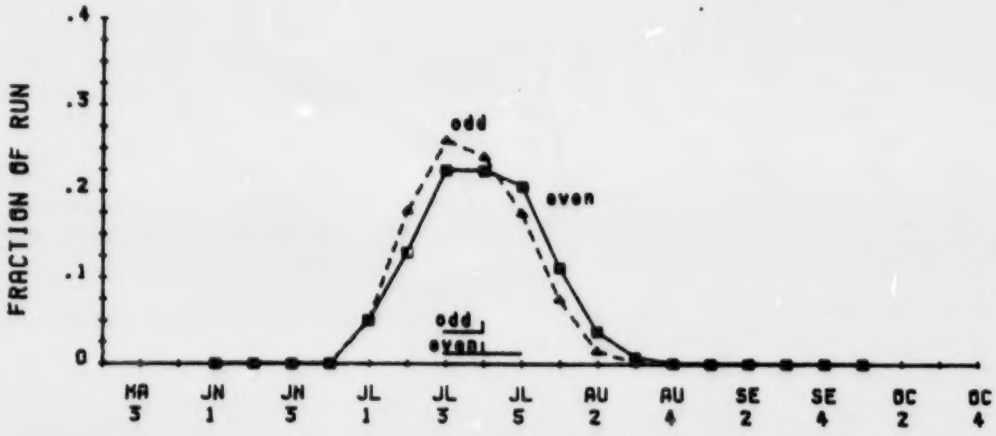
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Kwinamass/Khutzeymateen Pink

This group contains the Kwinamass and Khutzeymateen Rivers together with Dogfish Creek. These are fairly large systems, draining into Portland Inlet via inlets or bays, and support large odd and even populations of pink salmon. The management of the commercial fishery in Area 3 is tied very closely to escapements in these systems because of their proximity to the fishery and the relatively good quality of the spawning estimates obtained by weekly aerial surveys. These stocks are believed to have similar timing to the Iknouk/Ishkeenickh group, with escapement from the terminal fishery peaking the first week of August in odd years and one week later in even years.

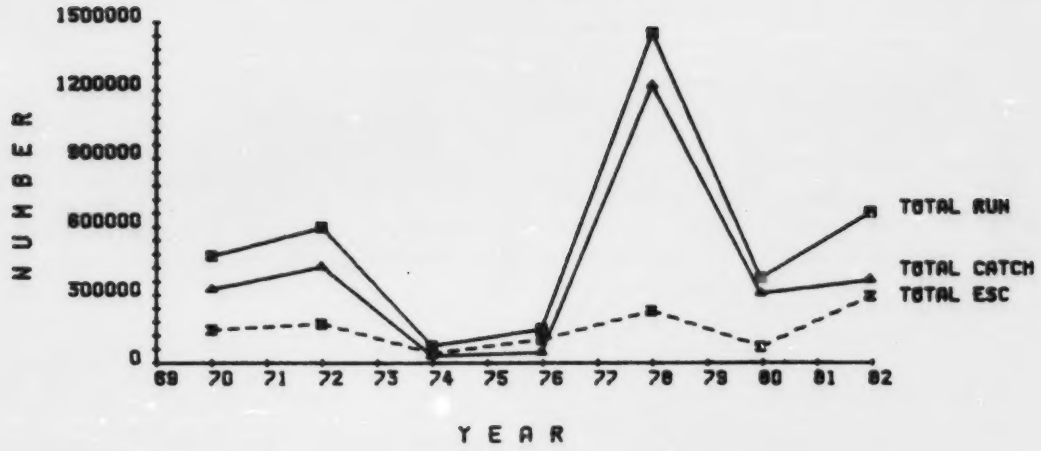
STOCK : KHUTZEYMATEEN/KWINAMASS

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH NATIVE	%CATCH A1 TRL	%CATCH A1 NET	%CATCH AR 3XY	%CATCH AR 3Z	%CATCH NOYES	%CATCH C.FOX
1970	469562	324562	145000	69.12	0.73	0.74	1.65	29.93	61.60	0.08	5.27
1971	93855	31857	61998	33.94	2.34	1.21	1.99	42.81	50.34	0.13	1.18
1972	595488	423485	172003	71.12	0.10	0.83	4.06	33.38	60.07	0.65	0.92
1973	142567	100569	41998	70.54	0.61	0.25	0.40	8.11	85.63	1.99	3.01
1974	76657	32658	43999	42.60	1.48	0.91	4.42	29.88	55.07	1.08	7.16
1975	89689	19690	69998	21.95	9.41	0.70	1.58	64.38	20.69	0.71	2.52
1976	148202	46206	101996	31.18	2.96	0.00	0.84	85.47	4.10	3.12	3.51
1977	574165	497161	77004	86.59	0.21	0.35	0.17	25.51	67.36	1.57	4.84
1978	1441871	1214873	226998	84.26	0.04	0.21	0.14	40.62	56.83	0.47	1.69
1979	45630	22428	23203	49.15	5.48	4.30	7.32	58.09	17.74	5.66	1.41
1980	374578	304580	69998	81.31	0.33	7.43	1.49	40.12	42.51	2.29	5.84
1981	256428	169427	87002	66.07	0.45	2.71	6.66	24.77	54.67	7.27	3.47
1982	659989	365992	293996	55.45	0.32	0.81	0.61	45.50	49.28	1.54	1.95

The even-year Khutzeymateen/Kwinamass stock, as for the odd-year Iknouk/Ishkeenickh stock, shows some evidence of an increasing trend in run size and escapement, but these are highly variable from year to year. The odd-year stock shows no trend in escapement and great variability in run size. The latter may be due to real environmental variations or may be due to a lack of year-to-year adjustments in the inputs - see the discussion for the Iknouk/Ishkeenickh stock.

Harvest rates over the period 1970-82 have averaged 62% in even years and 55% in odd years. On average, 89% of the catch of this stock was obtained in the Area 3 fisheries (3XY + 3Z), and this proportion has been quite stable over time, with a range of 76-97%. An increase in the proportion of the catch taken at Noyes Island is evident, but this has not exceeded 7.3%; overall, Alaskan catch has ranged from 1% to 11% (peaking in 1981). Local native food catch reached 9.4% of total catch in 1975, but is generally a much smaller catch component.

Entering run timing is as for the Ikouk/Ishkeenickh stock, with the 50% mark occurring during the fourth week of July.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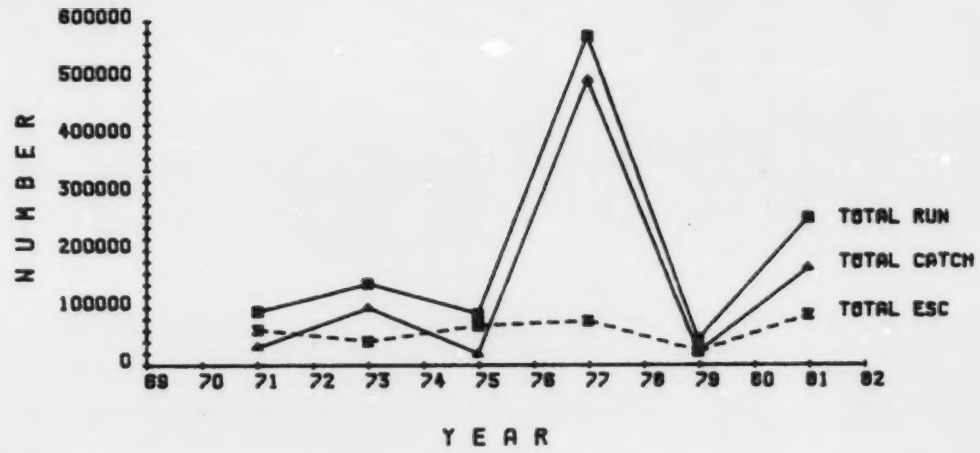
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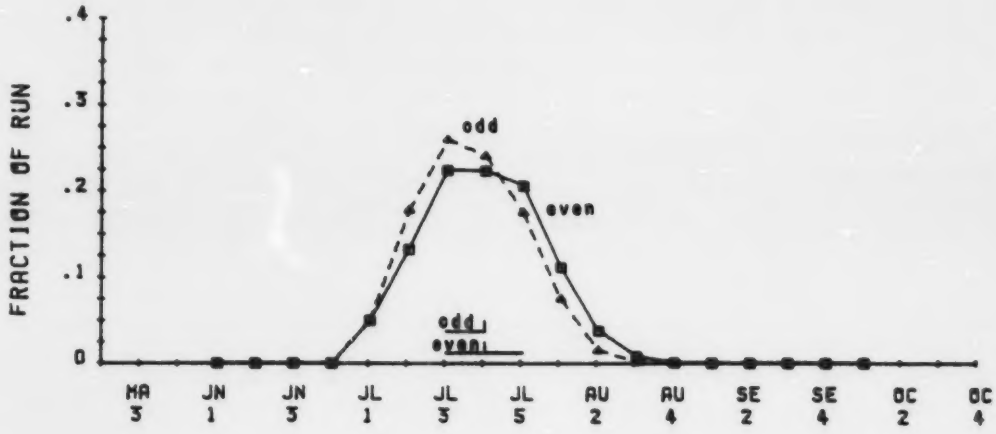
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Area 3 Coastal Pink

This group contains all stocks not included in the other two Area 3 groups; these are primarily small coastal stocks. Their timing is approximately three weeks later than the other two groups and consequently they are managed independently. These stocks are very susceptible to gravel scouring from fall floods and as a result their productivity is highly variable. In terms of contribution to escapements, such streams as Enshehese River, Lachmach River, Chambers Creek and Stagoo Creek are major stocks within this group although their timing tends to be slightly earlier than the majority of small coastal streams.

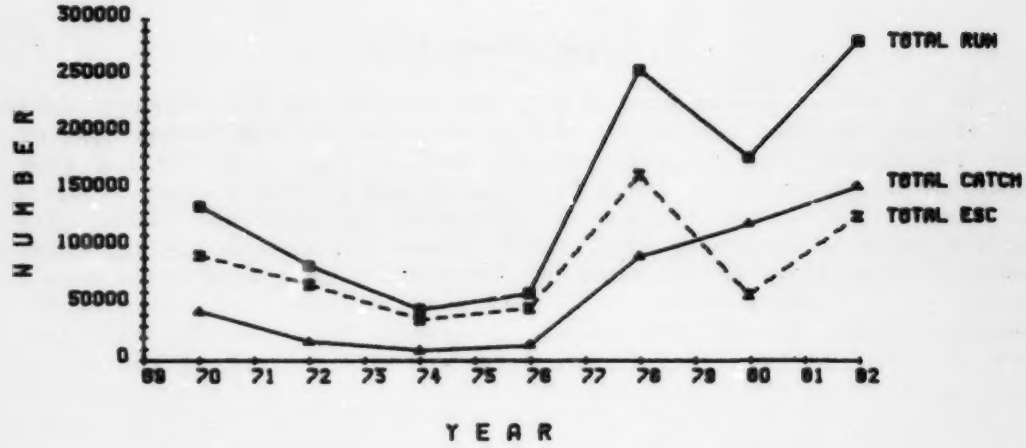
STOCK : AREA 3 COASTAL

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH NATIVE	%CATCH A1 TRL	%CATCH A1 NET	%CATCH AR 3XY	%CATCH AR 3Z	%CATCH NOYES	%CATCH C.FOX
1970	135462	43012	92450	31.75	3.50	0.47	10.29	65.33	10.43	0.29	9.69
1971	168831	111256	57575	65.90	0.62	2.65	5.42	47.34	38.73	3.91	1.34
1972	83477	16329	67148	19.56	0.98	3.81	3.40	66.59	10.10	10.84	4.29
1973	29220	12436	16785	42.56	1.97	3.98	2.41	13.37	53.11	8.32	16.84
1974	45351	9184	36167	20.25	4.32	4.89	14.46	25.83	9.27	10.38	30.86
1975	43150	12941	30208	29.99	6.18	2.61	2.41	53.06	19.83	0.00	15.92
1976	59771	13546	46225	22.66	4.57	1.59	0.00	67.95	15.86	0.52	9.50
1977	78571	36412	42159	46.34	1.56	5.33	5.89	41.73	25.32	4.72	15.45
1978	256171	92227	163944	36.00	0.38	1.05	0.09	80.40	2.28	4.25	11.55
1979	15303	6465	8838	42.25	7.25	24.97	23.33	41.25	2.02	0.94	0.24
1980	179267	120892	58375	67.44	0.69	8.93	1.35	69.98	1.38	1.20	16.46
1981	65061	37636	27424	57.85	0.64	27.59	14.06	7.24	7.00	22.28	21.19
1982	281751	153855	127895	54.61	0.33	3.71	0.07	67.53	9.98	12.96	5.42

The even-year coastal pink stock shows some increase in escapement, catch and particularly in run size, at least since 1974. Harvest rates, which averaged 36% over the entire time period, show an increasing trend, but this has been accompanied with increases in escapement. Odd-year pink, on the other hand, show some deterioration in escapement levels, but run sizes seem reasonably stable and harvest rates, averaging 48%, show no trend.

The proportion of the catch obtained in the Area 3 terminal fishery has averaged 65%, with a standard deviation of 20%. The aggregate Area 3 harvest rate appears to respond well to run size, increasing or decreasing in relation to run strength. Although no trend is evident, some years have seen large Noyes Island, Cape Fox and Area 1 components in the catch; for example 48% caught at Area 1 in 1979 and 43% caught in Alaska in 1981.

Entering timing for the Area 3 Coastal stock peaks during the second week of August for both odd and even years, but the odd year stock shows slightly earlier timing overall.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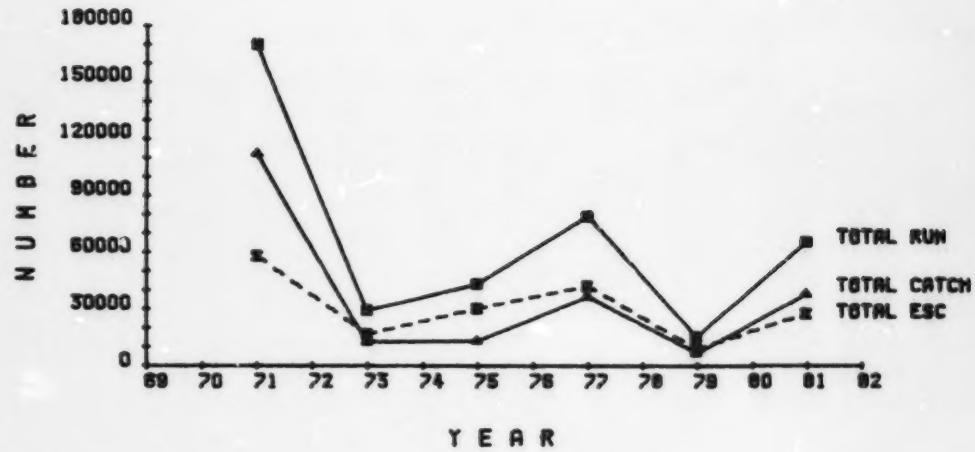
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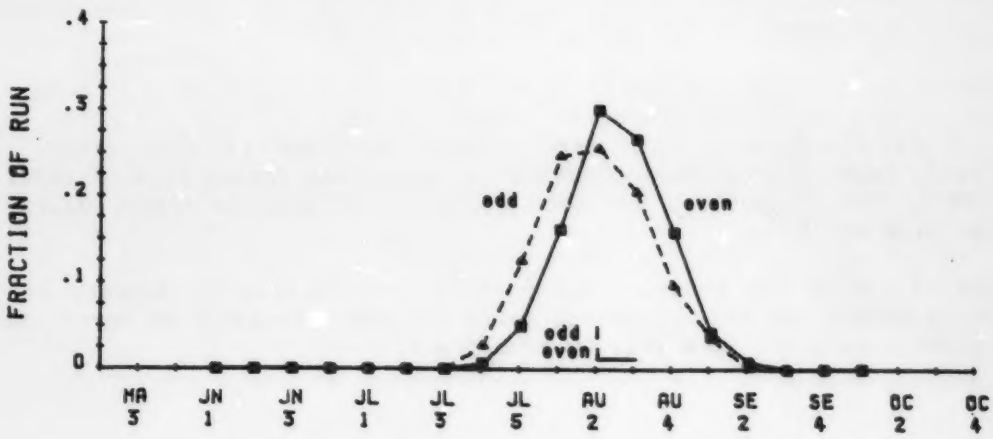
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Upper Skeena Pink

Two of the stocks in this group, the Kispiox and the Bulkley, exhibit a very strong odd year dominance, unlike any other in the Skeena system. The other two stocks, the Kitwanga and the Babine, have both odd and even year runs. All of these rivers drain into the Skeena at points greater than 200 km from its mouth and therefore may be considered as up-river stocks. They are slightly earlier in timing than lower Skeena stocks and are impacted quite heavily in some years by the terminal net fishery targeting on sockeye. This impact can be especially severe in odd years when the pink run tends to be slightly earlier than in even years. Escapement estimates for this group are among the best in the North Coast, with 50 to 90 percent of the Babine pink spawning occurring above the counting fence on the Babine River. In addition, a Petersen mark-recapture estimate was made of the Kispiox River stock in odd years from 1971 to 1979. Estimates for the Kitwanga and Bulkley stocks are obtained from aerial surveys.

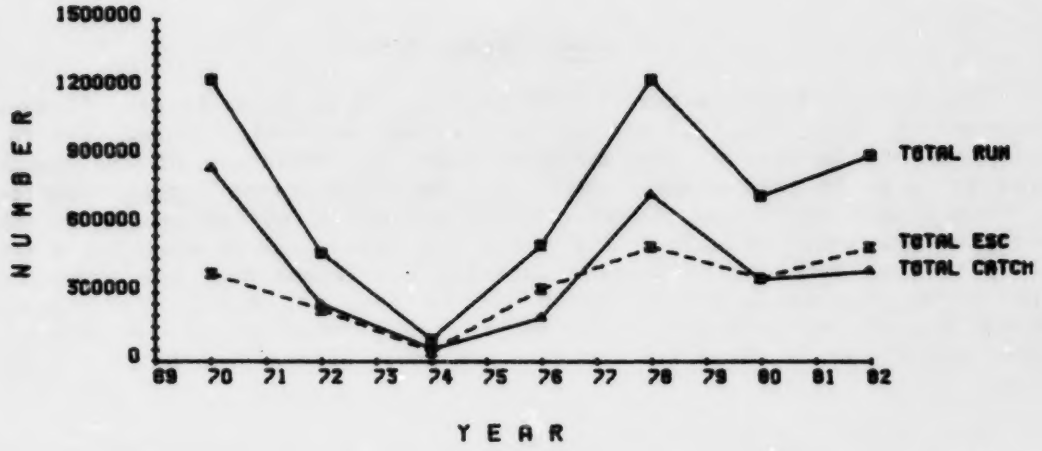
STOCK : UPPER SKEENA

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH NATIVE	%CATCH A1 TRL	%CATCH A1 NET	%CATCH A2E	%CATCH A3XY	%CATCH AREA 4	%CATCH AREA 5	%CATCH NOYES	%CATCH C.FOX
1970	1237505	849909	387595	68.68	0.15	0.60	0.87	0.00	8.27	36.17	50.03	0.06	3.86
1971	1194466	453493	740972	37.97	2.01	1.69	2.36	0.09	8.91	77.69	5.42	0.48	1.34
1972	478656	250621	228036	52.36	0.35	1.36	0.78	0.00	24.68	35.40	34.86	0.51	2.05
1973	1122422	437123	685299	38.94	1.00	1.10	1.05	0.09	8.21	72.24	7.36	4.18	4.76
1974	97250	53898	43352	55.42	0.86	0.83	0.50	0.00	21.54	67.31	3.15	0.56	5.24
1975	1208031	356317	851714	29.50	0.85	1.56	2.22	0.33	14.27	62.58	14.34	1.11	2.73
1976	511816	192337	319479	37.58	4.32	0.11	0.14	0.00	8.68	46.71	31.58	1.72	6.74
1977	1859453	1353105	506348	72.77	0.53	0.75	0.52	0.05	28.58	59.78	4.56	1.42	3.82
1978	1238295	733635	504659	59.25	1.91	0.50	0.15	0.00	45.18	32.25	13.76	1.13	5.12
1979	511128	336593	174535	65.85	1.51	3.45	4.61	0.63	20.42	57.94	5.11	5.05	1.28
1980	727700	361128	366572	49.63	0.77	9.04	1.51	1.61	38.66	27.53	10.11	3.17	7.61
1981	1061125	677232	383893	63.82	1.13	2.87	4.28	0.47	17.31	66.53	0.55	3.85	3.00
1982	904895	401785	503110	44.40	6.40	1.03	0.38	1.72	18.28	57.43	6.40	3.67	4.69

The even-year stock seems healthy, with an increasing trend in escapement, while odd-year escapements seem to be declining in the face of increasing harvest rates. Both odd and even years have experienced average overall harvest rates of 52% during the period 1970-82.

The primary fisheries impacting on Skeena pink are Area 3XY, Area 4 and Area 5. A decline in the proportion caught in Area 5 and an increase in the Area 3XY contribution to catch are evident over the 1970-82 period. The fraction of Upper Skeena catch obtained in Alaska has varied from 2% (1971) to 11% (1980); this proportion has been consistently high in recent years, but was also high in 1973.

The timing of the entering run peaks the third week of August, at Cape Fox, Noyes Island and Area 2E in odd years and one week later at Noyes Island, Langara and Area 5 (or Area 2E), in even years.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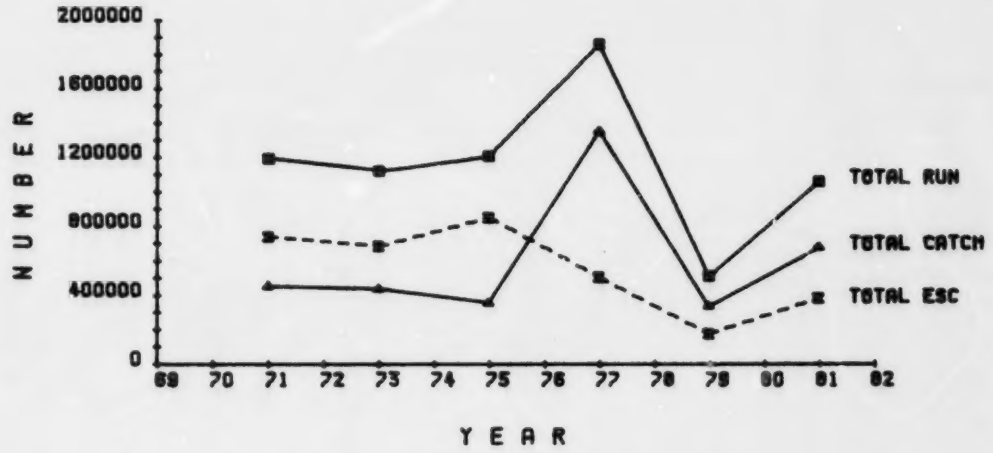
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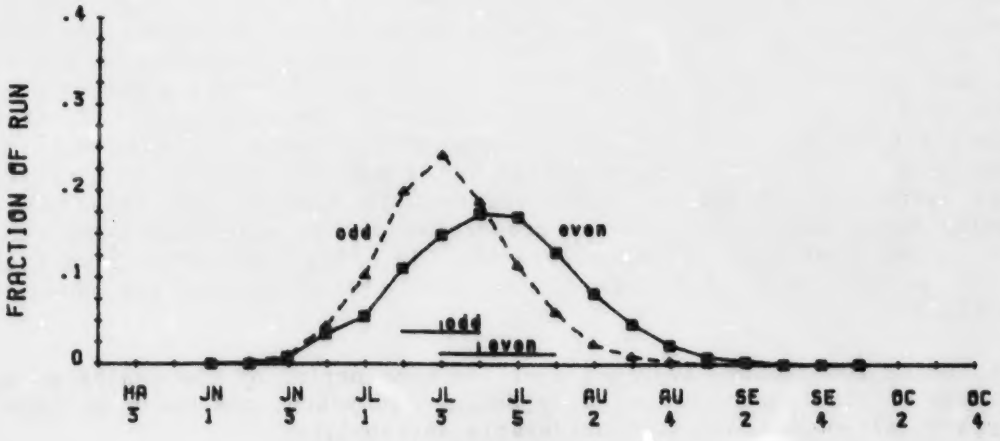
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Lower Skeena Pink

The Lakelse River is the largest pink salmon producer in Area 4, spawning escapements of up to to 1.5 million having been recorded. In addition to this tributary of the Skeena, the mainstem spawning population of the Skeena is also included in this group. While escapement estimates for the Lakelse may be fairly good because of the clarity of the river, estimates for the Skeena mainstem are poor because of its heavy silt load. Both spawning areas are close to each other, with Lakelse entering the Skeena near the upper end of the latter's spawning range, about 150 km from its mouth. All remaining Skeena stocks not included in the Upper Skeena stock group have been placed here, since most of these are found in the lower Skeena area below the Lakelse River.

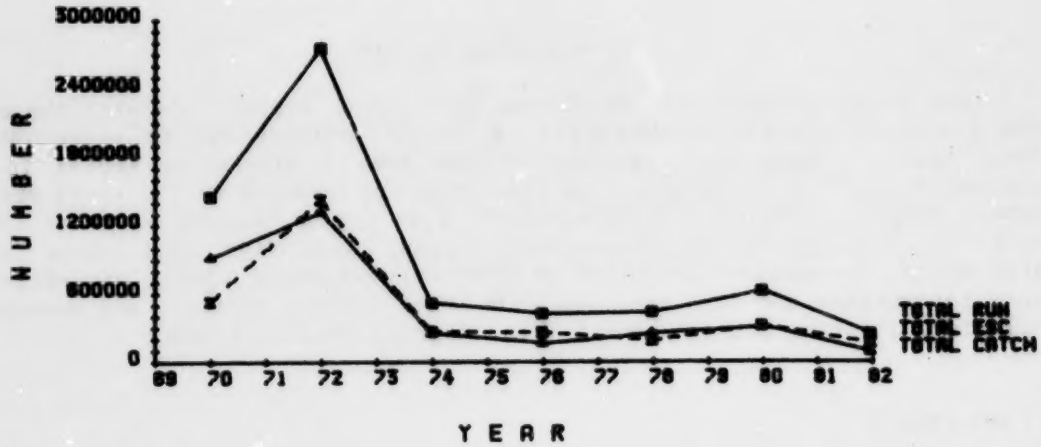
Escapement estimates are obtained primarily by aerial surveys while timing and migration route information comes from the interpretation by fishery officers and management biologists of catch and escapement timing data together with tagging results.

STOCK : LOWER SKEENA

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH NATIVE	%CATCH A1 TRL	%CATCH A1 NET	%CATCH A2E	%CATCH A3XY	%CATCH AREA 4	%CATCH AREA 5	%CATCH NOYES	%CATCH C.FOX
1970	1452836	921290	531546	63.41	0.19	0.29	0.38	0.00	8.17	41.70	46.16	0.07	3.03
1971	710905	385776	325129	54.27	1.04	2.14	2.66	0.10	11.12	73.86	7.51	0.54	1.03
1972	2757453	1323353	1434100	47.99	0.42	0.47	0.81	0.00	14.32	38.02	44.26	0.57	1.13
1973	954885	395931	560953	41.38	0.90	2.46	2.33	0.12	6.77	61.99	7.98	8.71	8.75
1974	518142	249613	268529	48.17	1.15	0.52	0.24	0.00	9.43	78.22	2.73	1.04	6.68
1975	1373658	405684	967974	29.53	0.85	0.95	0.67	0.17	11.08	61.00	19.59	0.70	4.97
1976	420115	159003	261112	37.85	4.31	0.10	0.02	0.00	6.72	36.41	44.43	0.76	7.25
1977	1344856	900079	444777	66.93	0.70	1.56	1.64	0.10	26.70	52.17	8.68	2.89	5.56
1978	438109	250030	188079	57.07	2.08	0.34	0.10	0.00	35.61	32.02	20.95	1.68	7.22
1979	987923	665695	322228	67.38	1.41	4.66	8.09	0.85	12.05	60.88	3.70	7.02	1.34
1980	626188	308493	317695	49.27	0.78	10.39	1.93	1.58	32.72	17.02	15.94	5.19	14.45
1981	1924431	1139733	784698	59.22	1.37	6.23	8.50	0.72	12.86	54.31	0.45	10.86	4.71
1982	244505	82123	162382	33.59	10.11	1.36	0.40	0.80	25.57	31.85	8.71	10.92	10.27

The odd-year Lower Skeena stock group has experienced an increasing trend in total run size, accompanied by stable escapements, an increasing harvest rate, and consequently increasing catches. The even-year stock, on the other hand, has not repeated its strong runs of 1970 and 1972, and a slight decline appears to have occurred over the 1970-82 period. Overall harvest rates have averaged 53% in odd years and 48% in even years, while the Area 4 terminal harvest rate since 1977 has averaged 36% (odd) and 12% (even). In even years, a high percentage of the catch is obtained in Area 5, but this has been declining since 1976. The Alaskan proportion of the catch has been high in recent years, averaging 16% over 1979-82. In 1982, the native food fishery took 10% of the catch, but before that year the proportion was never much above 4%.

Entering run timing, averaged over the time period of the analysis, shows a 50% mark at the fourth week of July during odd years, and one week later in even years, although there is considerable variability.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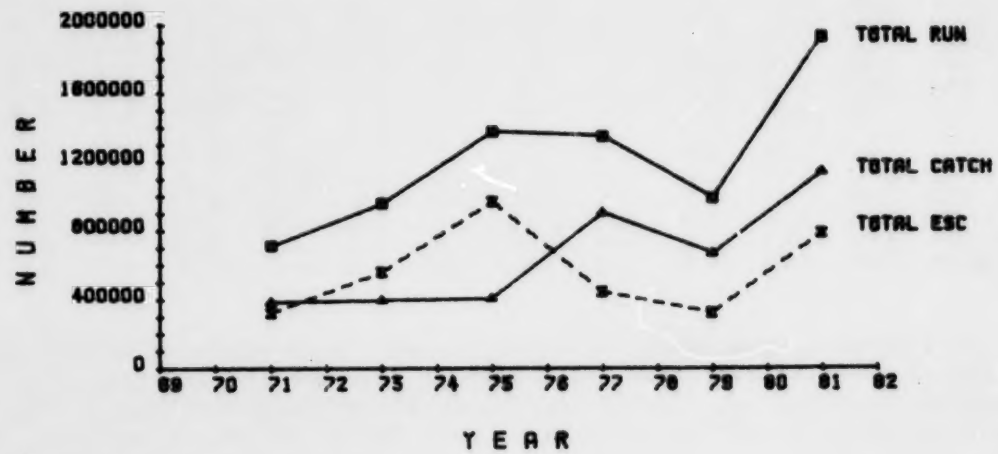
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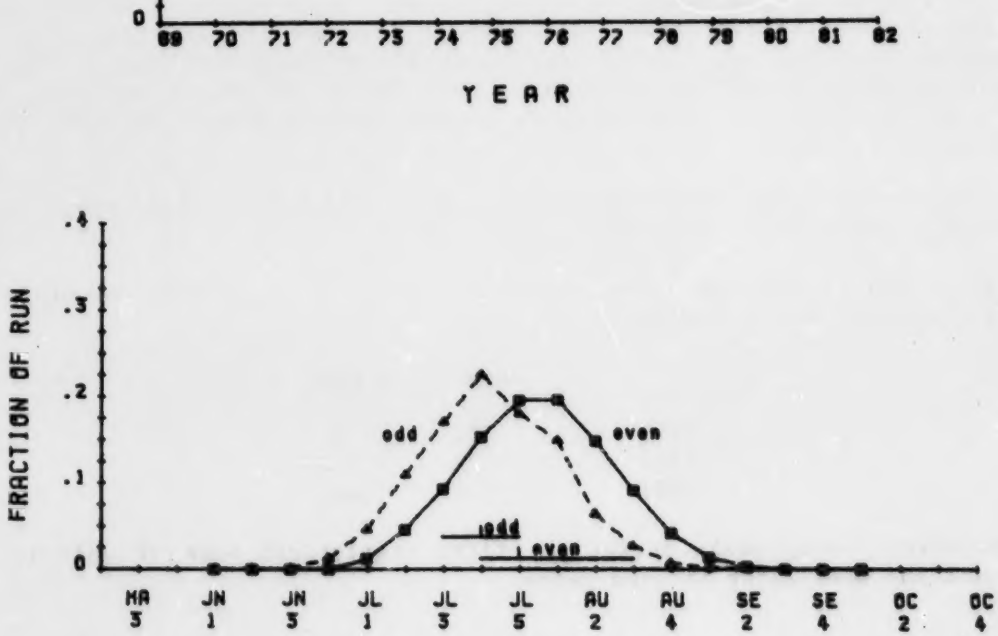
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Area 4 Coastal Pink

This group contains all non-Skeena Area 4 pink stocks. As with the small Area 3 coastal stocks, productivity is highly variable due to environmental fluctuations. These are the last of the Area 4 stocks to arrive in the terminal fishery area, entering in late July and peaking in the third week of August; they are managed independently to some degree because of this. Major stocks in this group are Moore Cove Creek, Oona River and Labou Creek. Escapements are usually estimated by foot surveys while timing and migration route information has been obtained from local fishery officers and management biologists and from the 1982 North Coast Tagging Project results.

STOCK : AREA 4 COASTAL

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH NATIVE	%CATCH A1 TRL	%CATCH A1 NET	%CATCH A2E	%CATCH A3XY	%CATCH AREA 4	%CATCH AREA 5	%CATCH MOYES	%CATCH C.FOX
1970	130934	80283	50651	61.32	0.21	0.23	0.62	0.00	8.20	42.58	44.68	0.09	3.40
1971	260344	153239	107105	58.86	0.86	2.92	3.11	0.10	13.09	68.80	8.23	1.75	1.14
1972	200274	99220	101054	49.54	0.39	0.52	0.75	0.00	18.41	38.41	39.40	0.90	1.22
1973	23876	10554	13321	44.21	0.80	9.67	1.37	0.14	6.92	60.28	6.52	5.36	8.95
1974	98554	42532	56023	43.16	1.40	0.88	0.62	0.00	8.60	70.48	3.84	2.17	12.01
1975	68638	19388	49250	28.25	0.91	2.90	4.14	0.22	12.81	51.34	20.00	0.68	7.01
1976	184011	73255	110756	39.81	3.93	0.04	0.32	0.00	12.28	59.06	17.67	3.24	3.46
1977	72117	46869	25248	64.99	0.76	2.08	2.20	0.22	26.41	49.09	9.47	3.60	6.17
1978	79255	44451	34804	56.09	2.17	0.36	0.10	0.00	32.62	29.23	25.56	1.94	8.03
1979	33905	21486	12419	63.37	1.68	14.06	16.04	1.27	5.76	49.51	2.44	8.31	0.94
1980	134896	72549	62347	53.78	0.65	10.63	1.78	1.30	24.12	8.80	15.32	7.83	29.56
1981	57394	37917	19477	66.06	1.02	29.20	11.88	0.61	3.44	19.94	0.22	26.53	7.16
1982	131174	47195	83979	35.98	9.10	1.31	0.45	1.16	22.61	42.54	8.77	6.97	7.09

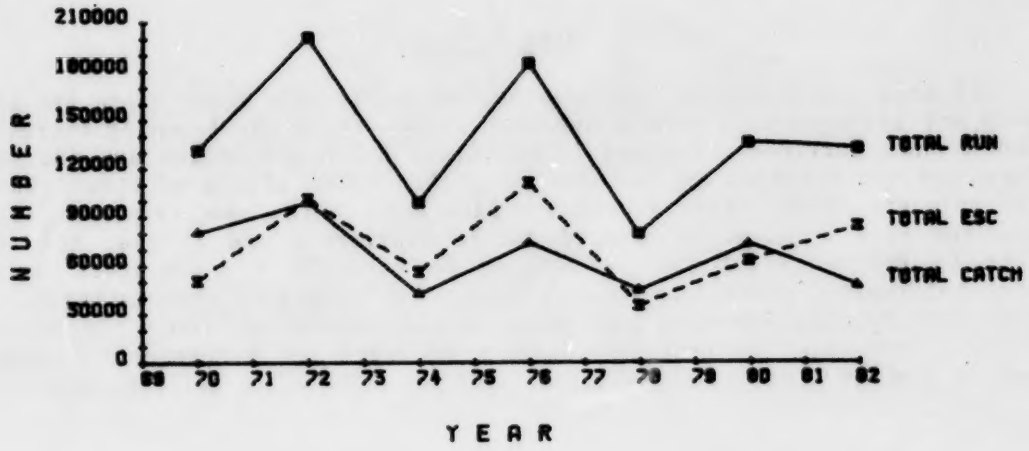
The even-year stock shows no strong trends, while odd-year harvest rates have been increasing over time, with perhaps some decline in stock strength. (Certainly there has been no recent repeat of the large 1971 run.) Harvest rates have averaged 49% in even years and 50% in odd years over the time period of the analysis. The terminal harvest rate in Area 4 has been highly variable, as follows:

1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
26%	41%	19%	27%	30%	14%	24%	32%	16%	32%	5%	13%	15%

In recent years, high proportions of the total catch were taken in the Area 1 fisheries and in Alaska:

	Area 1	Alaska
1979	30%	9%
1980	12%	37%
1981	41%	34%

Entering timing peaks during the fifth statistical week of July in odd years and one week later in even years.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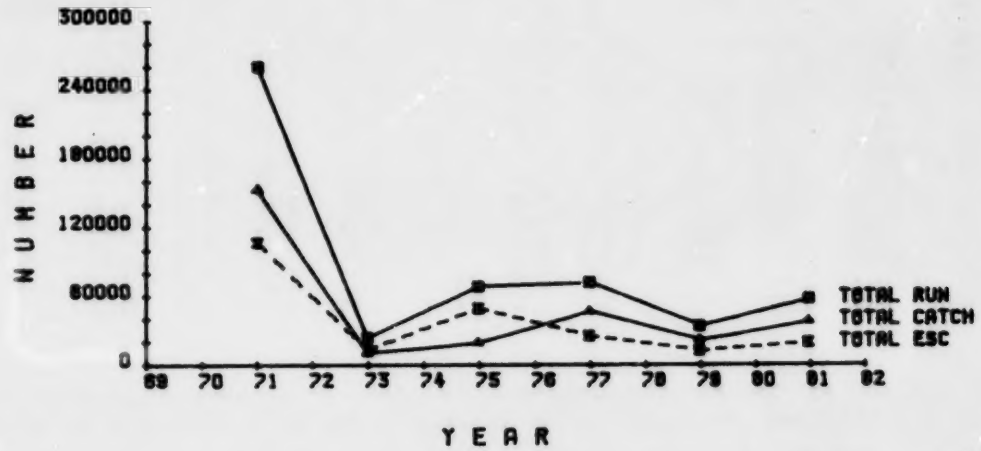
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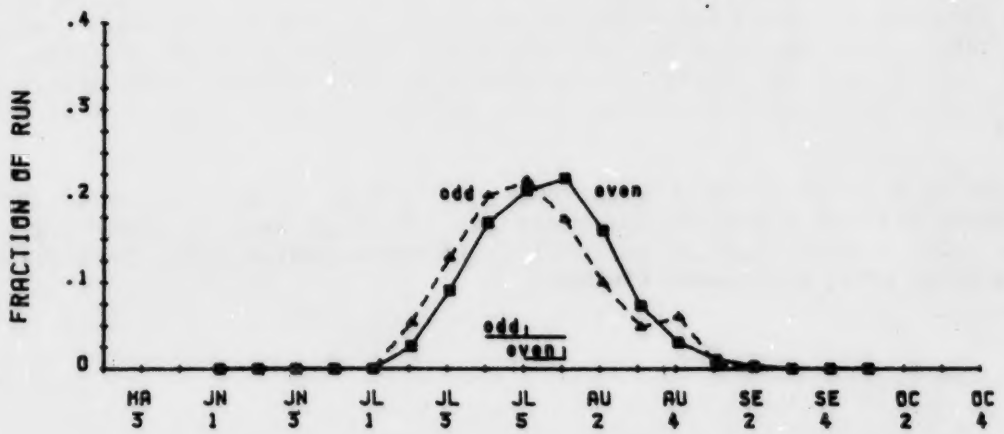
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Area 5 Pink

All Area 5 pink stocks have been aggregated in this group since the major stocks are situated on a single approach route, along the Browning Entrance - Ogden Channel corridor. Porcher Inlet, Alpha Bay and Kumealon are the major stocks and are surveyed by foot and air. Since the timing of these runs is later than the Skeena River runs which pass through the same terminal fishery area, the Area 5 group is managed fairly discretely and in fact the three stocks in Porcher Inlet can be managed in entirely a known-stock manner. Timing information comes from observations of build-ups on terminal inlets and appearance on the spawning grounds, while migration route information represents the best estimate of fishery officers and management biologists based on limited tagging data and the timing of catches in adjacent areas.

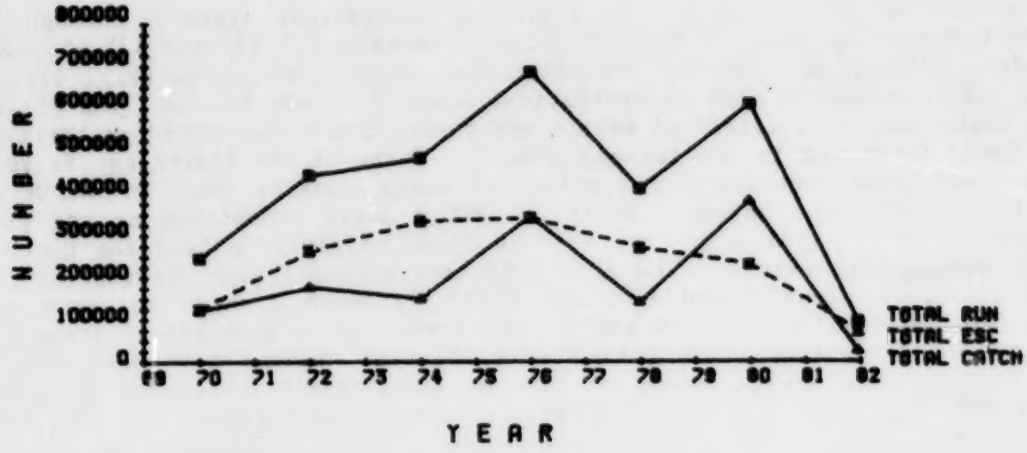
STOCK : AREA 5

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH NATIVE	%CATCH A1 TRL	%CATCH A1 NET	%CATCH A2E	%CATCH AREA 4	%CATCH AREA 5	%CATCH NOYES
1970	242711	120182	122529	49.52	0.08	0.19	4.09	0.00	7.58	87.90	0.16
1971	307657	230147	77510	74.81	0.04	2.84	1.70	0.08	33.70	47.80	13.83
1972	436501	176347	260154	40.40	0.17	0.63	1.00	0.00	8.07	87.84	2.30
1973	97744	38870	58874	39.77	0.34	5.21	2.82	0.28	21.96	49.44	19.95
1974	475538	146759	328779	30.86	0.07	1.45	6.91	0.00	5.45	83.74	2.38
1975	279534	109014	170520	39.00	1.19	1.40	0.91	1.01	12.06	83.42	0.00
1976	674913	338712	336201	50.19	0.15	0.00	0.00	0.00	0.72	98.99	0.14
1977	221764	111486	110278	50.27	0.00	5.57	4.91	0.63	18.22	56.83	13.83
1978	403156	138358	264798	34.32	0.04	0.60	0.08	0.00	8.65	85.28	5.36
1979	70388	26388	44000	37.49	0.00	33.77	22.62	2.45	24.05	15.15	1.96
1980	599470	373641	225829	62.33	0.00	6.94	1.33	0.35	0.46	87.99	2.93
1981	276335	154485	121850	55.90	0.39	18.48	13.60	1.85	9.86	8.88	46.94
1982	94051	23753	70298	25.26	0.84	1.09	0.05	0.51	1.47	82.10	13.94

No particular trends are apparent in Area 5 even-year pink stocks, although the 1982 run was much below average. Odd year stocks show highly variable runs and escapements. Harvest rates have averaged 42% in even years and 50% in odd years over the time period of the analysis.

The catch is primarily terminal in even years, with the proportion of the catch obtained in Area 5 being 88% in even years and 44% in odd years. Area 4 contributes 2% of the catch in even years and 10% in odd years (reaching 25% in 1971). Area 1 and Noyes Island area also substantial contributors; for example in 1981, 32% of Area 5 catch was obtained in Area 1 and 47% at Noyes Island.

The timing curves for the entering run of Area 5 pink show peaks during the second week of August in odd years and the third week of August in even years. The evident lack of variability in these median times reflects the constancy in input escapement timing.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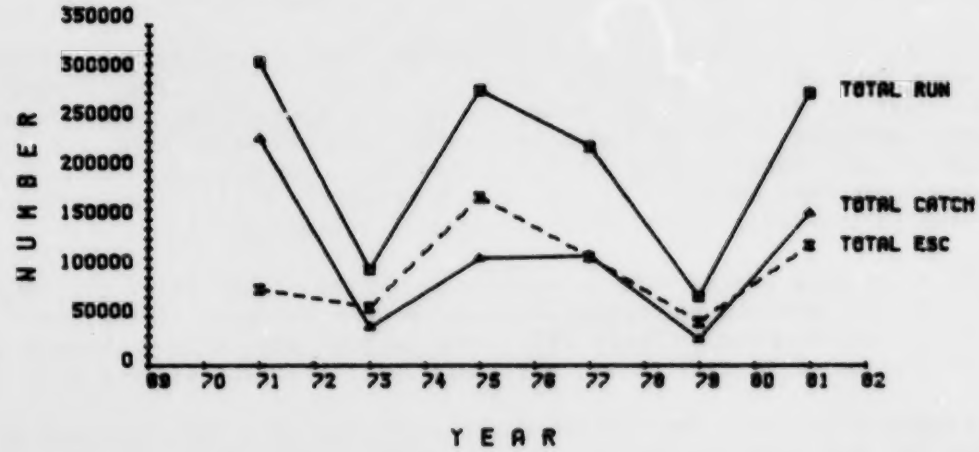
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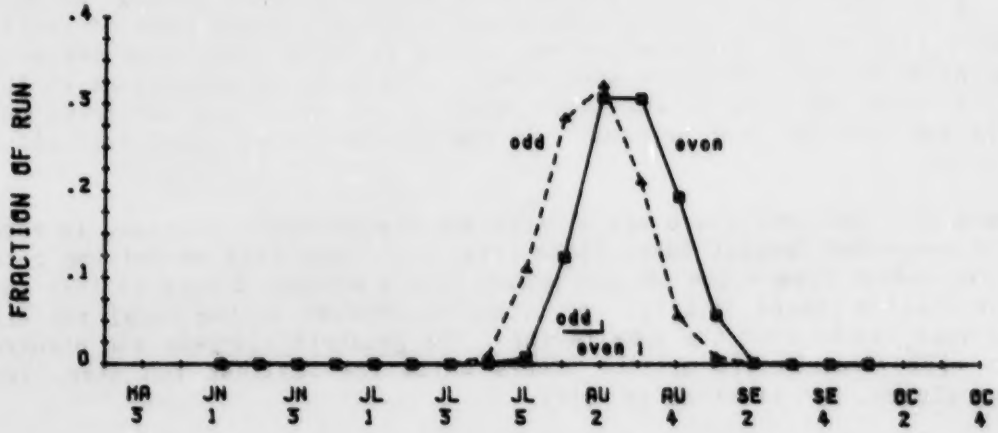
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Central Coast

The Central Coast region, incorporating statistical areas 6 through 10, lies on the western coast of British Columbia between 51° 15' and 53° 15' north latitude. Eight pink fisheries are identified within the region (Fig. 6). Of these, there is one in each of statistical areas 7, 9 and 10, two, the Gil and Laredo fisheries, in statistical area 6 and three, the Fisher-Fitzhugh, Dean and Bella Coola fisheries in statistical area 8. Three of the fisheries are known to intercept pink destined for statistical areas outside that in which the fisheries occur. The Laredo fishery harvest a small proportion of the pinks destined for statistical area 7 as well as those originating from the southern part of statistical area 6. The Area 7 fishery harvests pink originating from both statistical areas 7 and 8. The Fisher-Fitzhugh fishery harvests pink destined for statistical areas 8 and 9. The fisheries in statistical areas 6, 7 and 8 target on Central Coast pink stocks. Several changes have been made to these fisheries in recent years to reduce their impact on the other salmon species and other pink stocks originating outside the statistical areas in which the fisheries occur. The changes include the gradual elimination of the July portion of the Laredo fishery and the curtailment of the outer Milbanke Sound portion of the Area 7 fishery. The pink catches from statistical areas 9 and 10 are largely incidental and are taken during the latter part of the sockeye run.

Pink salmon are caught in the Gil, Laredo, Area 7 and Fisher-Fitzhugh fisheries with both gillnets and seine nets (Table 13). In all four fisheries the greater part of the catch is taken in seining operations. The Area 9 fishery also employed both gillnets and seine nets between 1970 and 1978 although the gillnet catch always exceeded that taken by seines. Since 1978 only gillnets have been employed in the Area 9 fishery. Gillnets are the only gear type used in the Bella Coola, Dean and Area 10 fisheries.

Fifteen major pink stocks were identified in Central Coast (Fig. 6). Eight of the major stocks were disaggregated into sub-stocks based on timing, routing and management considerations (Table 14). The largest stocks were located in the northern portion of Central Coast, particularly in statistical area 6.

Pink salmon begin entering Central Coast fisheries in early July and peak in abundance in late July and early August. During this period of shoreward migration pink salmon move rapidly, not spending more than a week in any one fishery. Following escapement from the terminal fisheries, pink salmon move directly into streams and rivers where spawning generally peaks during the month of August (Table 15). While the general temporal pattern of movement of Central Coast pink salmon is as described above, little is known about the degree of annual variation in run timing for most stocks. The possible exceptions to this generalization are the Atnarko and Koeye River stocks which are monitored more intensively and used as "key streams" for the management of other statistical area 8 stocks.

Between 1970 and 1982 there was a large but discontinuous decrease in total run size of even-year Central Coast pinks (Fig. 7). Over this period the total run size has varied from a low of approximately 2.5 million pieces in 1974 to a high of 7.0 million pieces in 1972. No trend was evident in the total run size of the odd-year stocks over the same period. The greatest odd-year run occurred in 1977 at approximately 5.0 million pieces while the smallest run size, less 1.0 million pieces, was recorded in 1979.

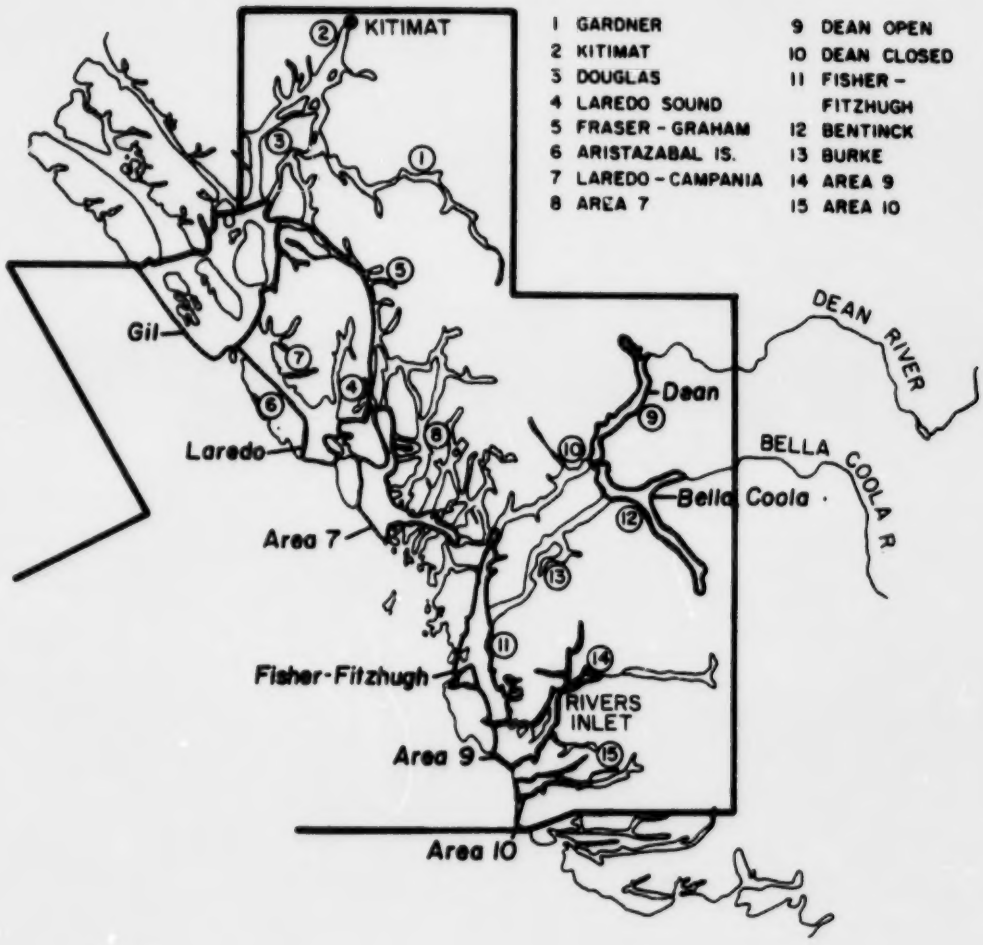


Fig. 6. The major pink salmon stocks and pink salmon fisheries (boldface type) on the Central Coast.

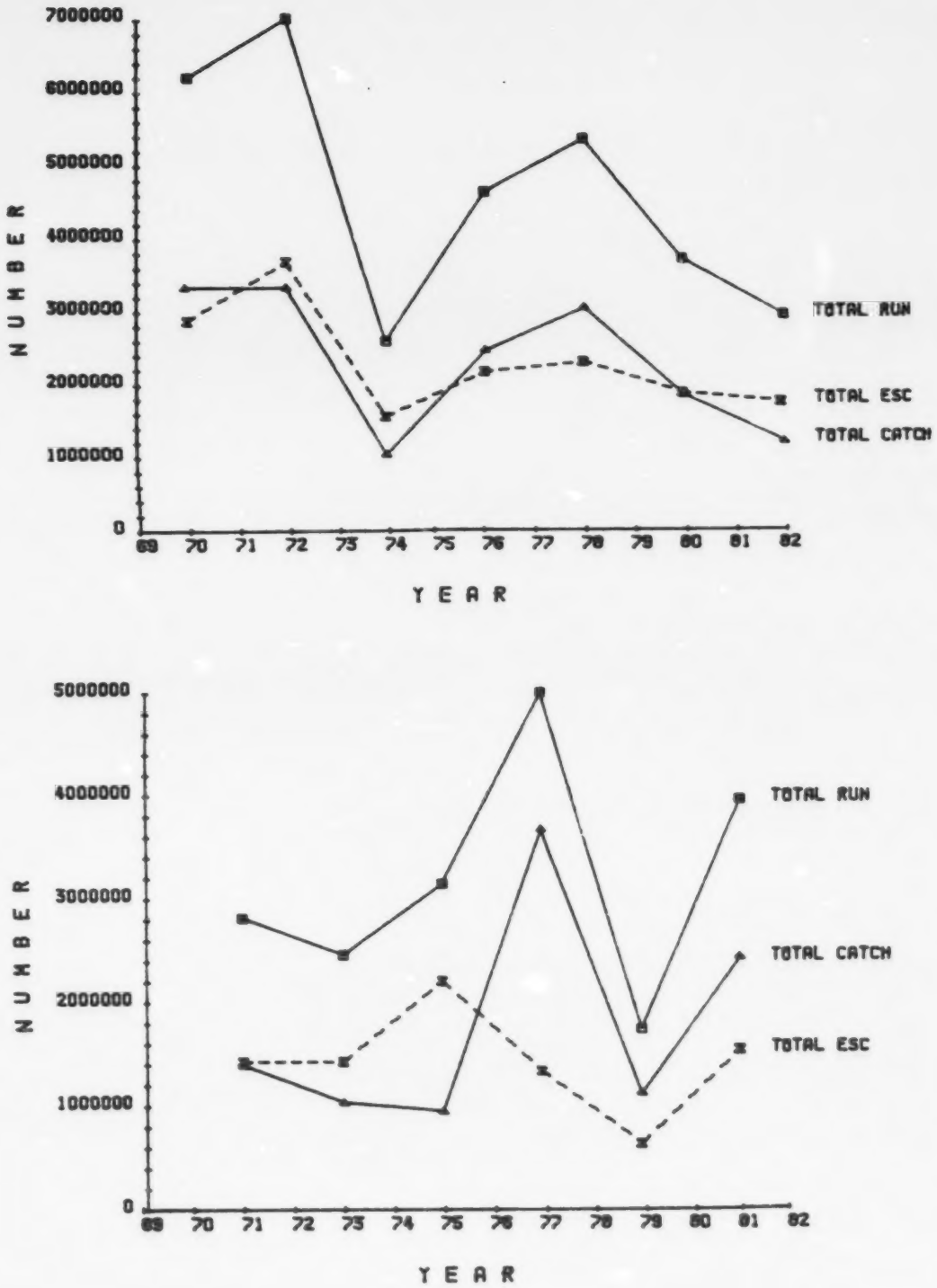


Fig. 7. Catch, escapement and total run size for even-year and odd-year Central Coast pink salmon stocks, 1970 to 1982.

Table 13. Gear types employed in Central Coast pink fisheries and catch timing in the fisheries.

Fishery	Gear Types(s)	Catch Timing		
		Start	Peak	End
Gil	gillnet/seine net	late June	mid to late July	mid August
Laredo	gillnet/seine net	mid July	late July to early August	late August
Area 7	gillnet/seine net	mid July	mid August	late August
Fisher-Fitzhugh	gillnet/seine net	early to mid July	early August	early September
Dean	gillnet	late June to early July	mid July	late August
Bella Coola	gillnet	early July	late July	late August
Area 9	gillnet/seine net	early July	late July	mid to late August
Area 10	gillnet	early to mid July	late July	mid to late August

Table 14. Migration routes through fisheries for Central Coast Pink stocks and sub stocks.

Stock Name	Sub-stock Name	Routing by Fishery	Proportion of Stock Utilizing each Route
Gardner	Gil/Gardner	Gil	0.8
	Laredo/Gardner	Laredo->Gil	0.2
Kitimat	Gil/Kitimat	Gil	0.8
	Laredo/Kitimat	Laredo->	0.2
Douglas	Gil/Douglas	Gil	0.8
	Laredo/Douglas	Laredo->	0.2
Laredo Sound	none	Laredo	1.0
Fraser-Graham	none	Laredo	1.0
Aristazabal Island	none	Laredo	1.0
Laredo-Compania	none	Laredo	1.0
Area 7	Area 7	Area 7	0.8
	Laredo/Area 7	Laredo-> Area 7	0.2
Dean Open	Fisher-Fitzhugh/Dean Open	Fisher-Fitzhugh-> Dean	0.6
	Area7/Dean Open	Area 7-> Dean	0.2
	Bella Coola/Dean Open	Fisher-Fitzhugh->Bella Coola->Dean	0.2
Dean Closed	Fisher-Fitzhugh/Dean Closed	Fisher-Fitzhugh	0.7
	Area 7/Dean Closed	Area 7	0.3
Fisher-Fitzhugh	none	Fisher-Fitzhugh	1.0
Bentinck	Burke/Bentinck	Fisher-Fitzhugh->Bella Coola	0.7
	Dean Closed/Bentinck	Fisher-Fitzhugh->Bella Coola	0.2
	Area 7/Bentinck	Area 7->Bella Coola	0.1
Burke	none	Fisher-Fitzhugh	1.0
Area 9	Area 9	Area 9	0.9
	Fisher-Fitzhugh/Area 9	Fisher-Fitzhugh->Area 9	0.1
Area 10	none	Area 10	1.0

Table 15. Spawning escapement timing for Central Coast pink stocks.

Stock		Escapement Timing		
		Start	Peak	End
Gardner	(even)	mid July	early August	late August
	(odd)	late July	early-mid August	early September
Kitimat	(even)	mid July	early August	late August
	(odd)	late July	early-mid August	early September
Douglas	(even)	mid July	early August	late August
	(odd)	late July	early-mid August	early September
Laredo Sound	(even)	late July	mid August	mid September
	(odd)	late July	mid August	mid September
Fraser-Graham	(even	mid July	late July-early August	early September
	(odd)	mid July	early August	early September
Aristazabal Island	(even)	late July	early-mid August	early-mid Sept
	(odd)	early August	mid August	early September
Laredo-Campania	(even)	late July	early-mid August	early-mid Sept.
	(odd)	early August	mid August	early September
Area 7	(even)	late July-early August	late August	mid September
	(odd)	mid-late July	mid August	early September
Dean Open	(even)	late June-early July	late July	early-mid Sept.
	(odd)	mid July	early August	late August
Dean Closed	(even)	mid-late July	early-mid August	early September
	(odd)	mid July	early August	late August
Fisher-Fitzhugh	(even)	late July	mid August	early September
	(odd)	mid August	early-mid September	late September
Bentinck	(even)	late July	late August	mid September
	(odd)	late July	early-mid August	late August
Burke	(even)	late July	early August	early September
	(odd)	mid July	early August	early September
Area 9	(even)	late July	mid August	early September
	(odd)	mid July	early August	late August
Area 10	(even)	late July	mid August	early September
	(odd)	mid July	early August	late August

Gardner Pink

The Gardner pink stock aggregation originates from 10 tributaries of Gardner Canal located at the north end of statistical area 6. The strength of the stock, dominant in even years between 1970 and 1982, is highly dependent on returns to the Kemano River which accounts for approximately 90% of the total escapement of the stock. The Gardner pink stock is the target of two fisheries, both located in statistical area 6. The Gil fishery, at the mouth of Douglas Channel in the vicinity of Gil Island, accounts for approximately 95% of the total catch of the stock. The remainder of the catch is taken in a fishery situated in the vicinity of Laredo Channel at the south end of statistical area 6.

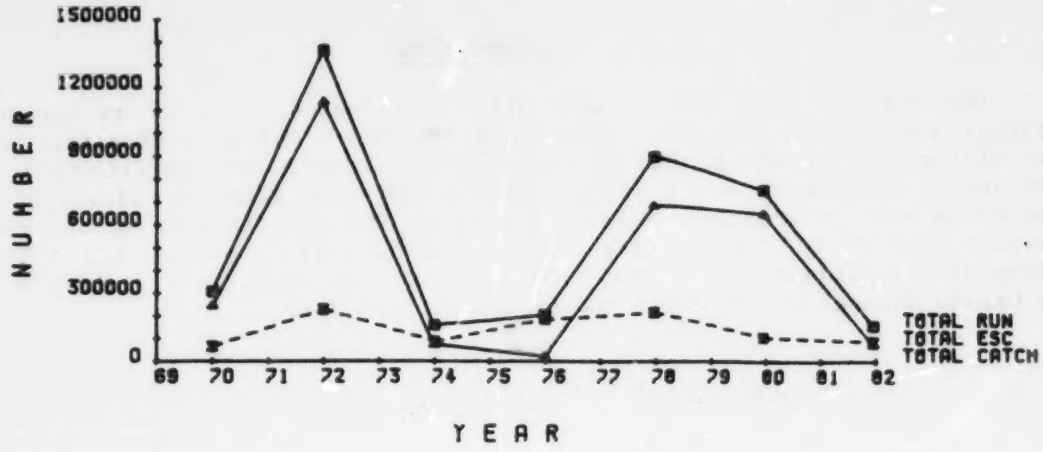
STOCK : GARDNER

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH GIL	%CATCH LAREDO
1970	307826	243326	64500	79.05	98.41	1.59
1971	7632	3432	4200	44.97	97.61	2.39
1972	1370315	1143390	226925	83.44	96.34	3.66
1973	23716	17091	6625	72.07	99.24	0.76
1974	159477	72952	86525	45.74	95.15	4.85
1975	14929	5819	9110	38.98	98.76	1.24
1976	202591	18091	184500	8.93	94.79	5.21
1977	16826	11776	5050	69.99	92.15	7.85
1978	898574	683725	214849	76.09	88.17	11.83
1979	105196	62446	42750	59.36	91.00	9.00
1980	753806	649106	104700	86.11	97.57	2.43
1981	178436	132036	46400	74.00	94.23	5.77
1982	155124	72255	82869	46.58	97.29	2.71

The mean run size of the even-year Gardner stock represented approximately 20% of the mean run size of all statistical area 6 even-year pink stocks between 1970 and 1982. Annual estimates of catch and total run size for the even-year stock showed no consistent trend and varied by an order of magnitude between 1970 and 1982. The largest catch and run size occurred in 1972 at approximately 1.1 and 1.4 million pieces respectively. The smallest catch, 72,255 pieces, and run size, 155,124 pieces were recorded in 1982. Escapement estimates have generally followed changes in total run size and have ranged from 64,000 pieces in 1970 to 227,000 pieces in 1972. The mean harvest rate between 1970 and 1982 was 60.8%

The mean run size of the odd-year Gardner stock represented approximately 22% of the mean run size of all statistical area 6 odd-year pink stocks between 1971 and 1981. Total run size, catch and escapement of the odd-year stock were very small between 1971 and 1977. In subsequent years there was a rapid increase in abundance of the odd-year year run to an extent that there was no clear difference in the size of odd-and even-year runs in the early 1980's. The mean harvest rate between 1971 and 1981 was 59.9%.

The average median for entering run timing at the Gil and Laredo fisheries occurs during the third week of July in even-years. Odd-year pink peak one week later.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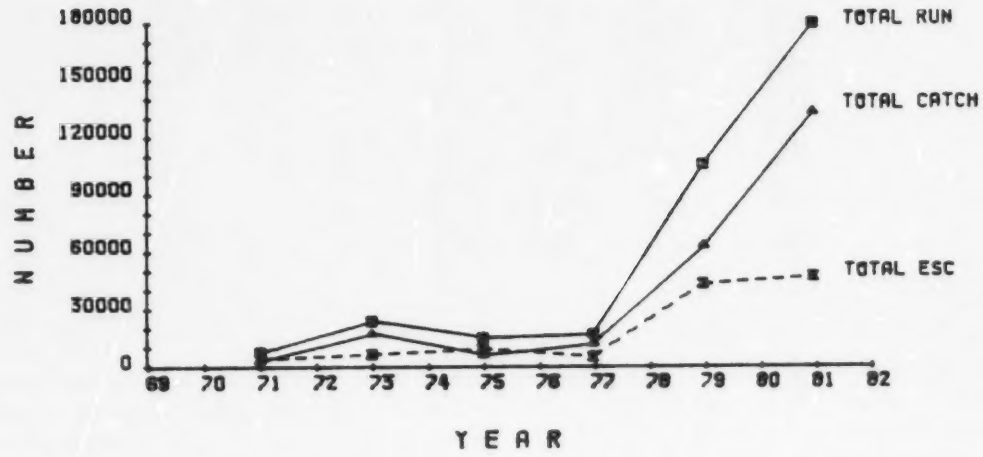
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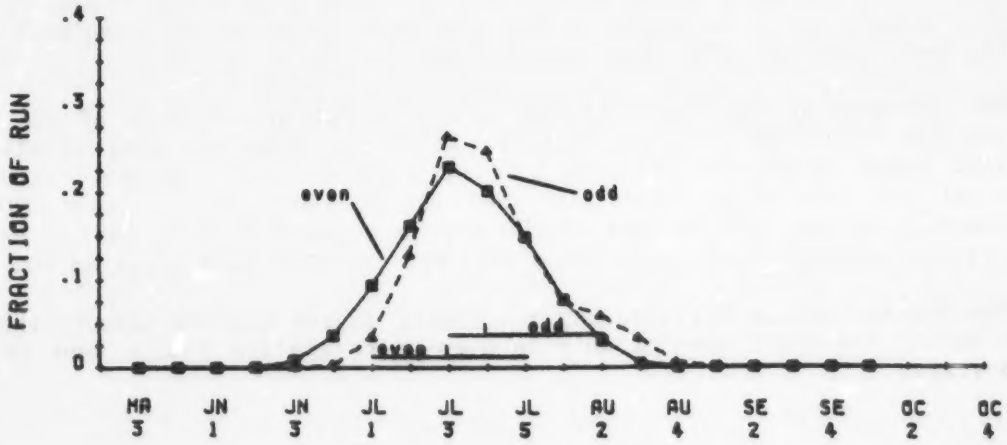
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Kitimat Pink

The Kitimat pink stock aggregation originates from 14 tributaries of Kitimat and Kildala Arm both located at the north end of statistical area 6. One of these tributaries, the Kitimat River, accounts for approximately 50% of the annual escapement of the stock. The Kitimat pink stock is the target of two fisheries both located in statistical area 6. The Gil fishery, at the mouth of Douglas Channel in the vicinity of Gil Island, takes approximately 95% of the catch of the Kitimat pink stock. The remainder is taken in a fishery situated in Laredo Channel at the south end of statistical area 6.

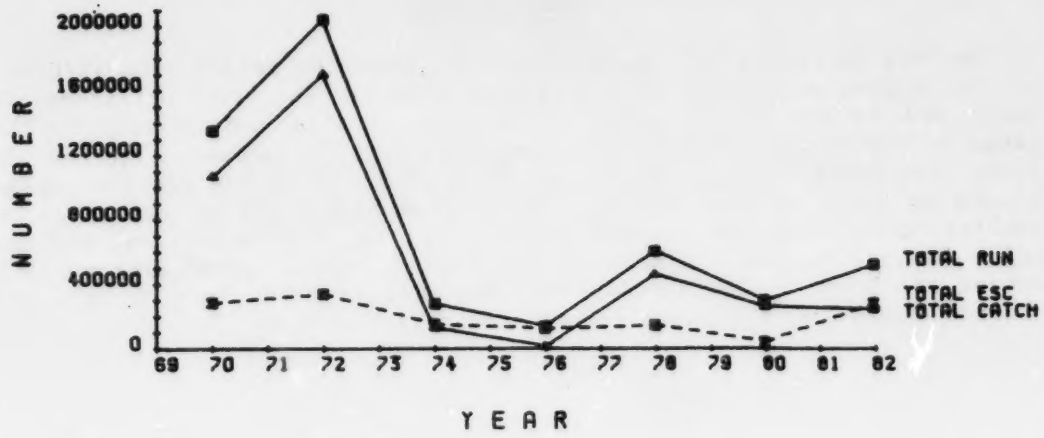
STOCK : KITIMAT

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH GIL	%CATCH LAREDO
1970	1350254	1067328	282926	79.05	98.41	1.59
1971	8768	3943	4825	44.97	97.61	2.39
1972	2033963	1697138	336825	83.44	96.34	3.66
1973	18865	13595	5270	72.07	99.24	0.76
1974	274352	125501	148851	45.74	95.15	4.85
1975	9332	3637	5695	38.98	98.76	1.24
1976	135248	12078	123171	8.93	94.79	5.21
1977	18192	12732	5460	69.99	92.15	7.85
1978	601524	457701	143824	76.09	88.17	11.83
1979	24337	14447	9890	59.36	91.00	9.00
1980	298140	256730	41410	86.11	97.57	2.43
1981	84180	62290	21890	74.00	94.23	5.77
1982	519551	242001	277550	46.58	97.29	2.71

The Kitimat pink stock aggregation was dominant in even-years between 1970 and 1982. Over this period the mean run size of the even-year Kitimat pink stock represented approximately 27% of the mean run size of all statistical area 6 even-year pink stocks. Total run size and catch of even-year Kitimat pink declined rapidly following a peak in 1972 and have not recovered. Escapement estimates, generally fluctuating between 100,000 and 300,000 pieces, exhibited no clear trend although escapement to the Kitimat River is known to have decreased dramatically in recent years. Harvest rates on the even-year stock over the period 1970 to 1982 have averaged 61%.

The odd-year Kitimat run averaged less than 10% of the size of the even-year run and accounted for approximately 3% of the mean run size of all odd-year pink stocks in statistical area 6. Estimates of total run size, catch and escapement for the stock have increased almost continuously since 1971 to approximately 84,000, 62,000 and 22,000 pieces respectively in 1981. Harvest rates on the odd-year stock over the period 1971 to 1981 have averaged 60%.

The average median for entering run timing at the Gil and Laredo fisheries occurs during the third week of July in even-years and the fourth week of July in odd-years.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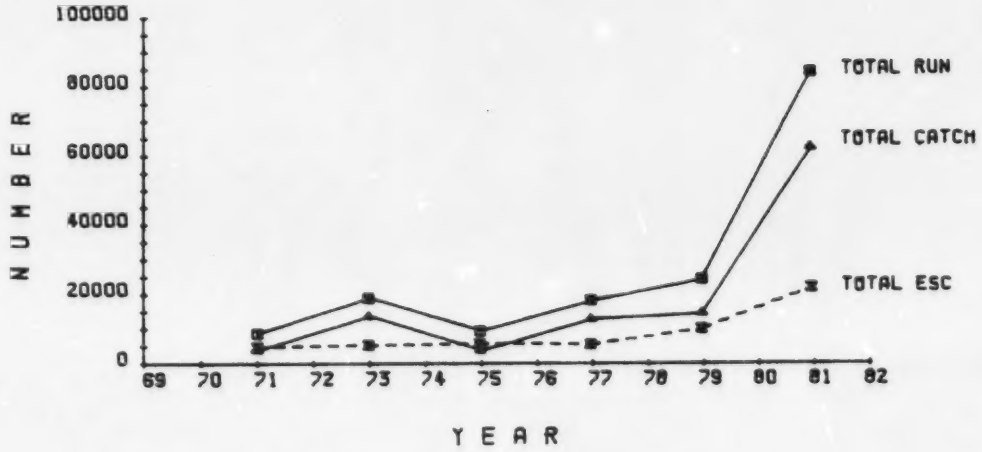
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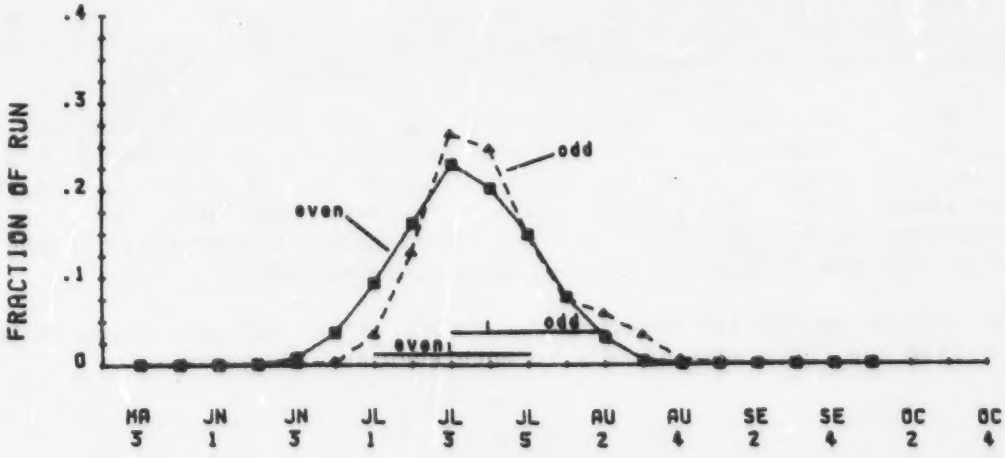
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Douglas Pink

The Douglas pink stock aggregation has, over the period from 1970 to 1982, been the largest pink stock in statistical area 6. The stock originates from 19 streams and rivers in the area of Douglas, Ursula and Devistation Channel located at the north end of statistical area 6. The escapement to one of these systems, the Quaal River, accounts for more than 50% of the total escapement of the Douglas stock in most years. The Douglas pink stock is the target of two fisheries both located in statistical area 6. The Gil fishery, at the mouth of Douglas Channel in the vicinity of Gil Island, takes approximately 95% of the catch of the Douglas pink stock. The remainder is taken in a fishery situated in Laredo Channel at the south end of statistical area 6.

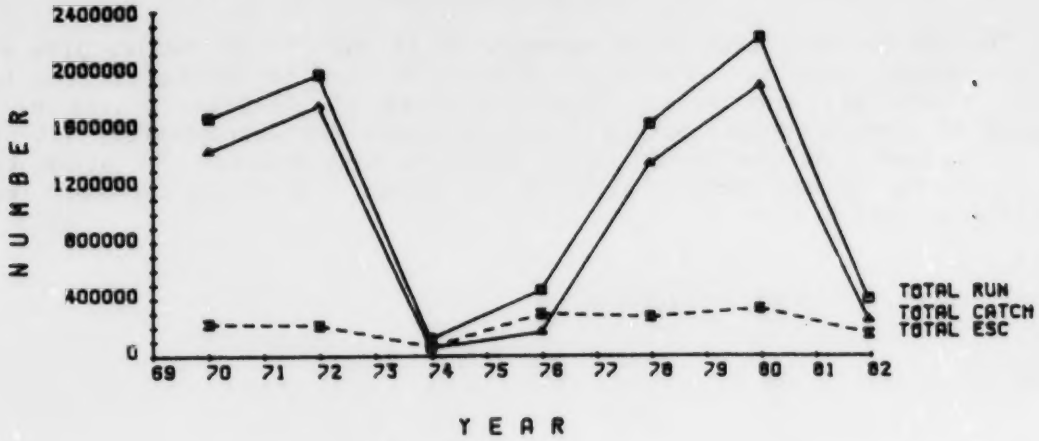
STOCK : DOUGLAS

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH GIL	%CATCH LAREDO
1970	1690278	1460026	230251	86.38	98.57	1.43
1971	372620	202144	170476	54.25	99.94	0.06
1972	1997216	1780414	216802	89.14	96.76	3.24
1973	466735	366435	100300	78.51	99.03	0.97
1974	125942	61542	64400	48.87	97.26	2.74
1975	239452	28447	211004	11.88	97.01	2.99
1976	466736	168538	298198	36.11	98.98	1.02
1977	413530	330640	82890	79.96	93.28	6.72
1978	1635984	1359508	276476	83.10	89.70	10.30
1979	848038	573287	274752	67.60	93.92	6.08
1980	2229489	1894690	334799	84.98	97.10	2.90
1981	1095261	935670	159592	85.43	93.87	6.13
1982	401187	250135	151052	62.35	97.70	2.30

The Douglas pink stock was dominant in most even-years between 1970 and 1982. Over this period the mean run size of the even-year Douglas stock represented approximately 45% of the mean run size of all statistical area 6, even-year pink stocks. The largest run size and catch occurred in 1980 at approximately 2.2 and 1.9 million pieces respectively. The smallest run size, 126,000 pieces, and catch 61,000 pieces, occurred in 1974. There has been no clear trend in escapement estimates which for most years have been between 100,000 and 300,000 pieces. Harvest rates on the even-year stock over the period 1970 to 1982 have averaged 70%.

The size of the odd-year Douglas stock averaged 47% of the even-year stock and accounted for approximately 72% of the mean run of all odd-year pink stocks in statistical area 6. The run size and catch of the stock has increased steadily since 1975. Escapement estimates however have shown no consistent trend, fluctuating between 80,000 and 275,000 pieces. Harvest rates on the odd-year stock over the period 1971 to 1981 have averaged 62%.

The average median for entering run timing at the Gil and Laredo fisheries occurs during the fifth week of July in both even-and odd-years.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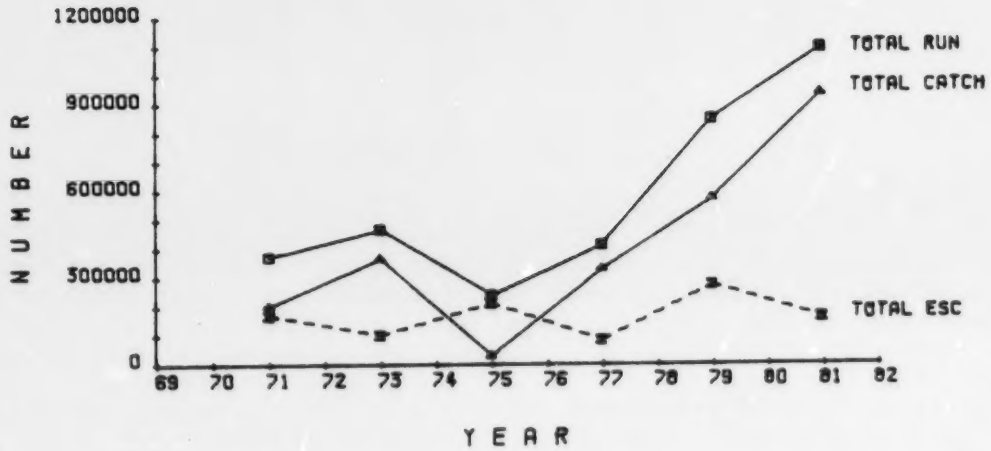
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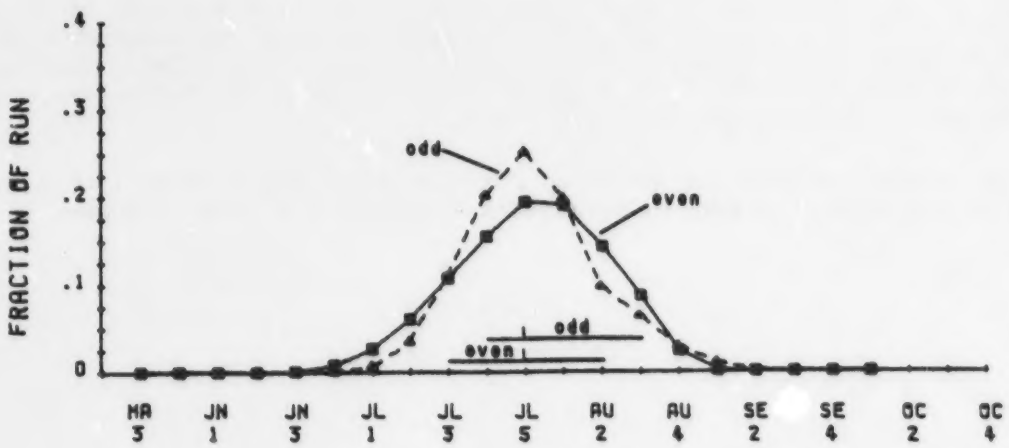
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Laredo Sound Pink

The Laredo Sound pink stock aggregation is one of the smaller pink stocks in statistical area 6. The stock originates from 19 streams in the Laredo Inlet, Kitasu Bay area in the central portion of statistical area 6. The largest of these systems, Arnoup Creek, accounts for approximately 30% of the total escapement of the Laredo Sound stock in most years. The stock is the target of the Laredo fishery situated in Laredo Channel at the south end of statistical area 6.

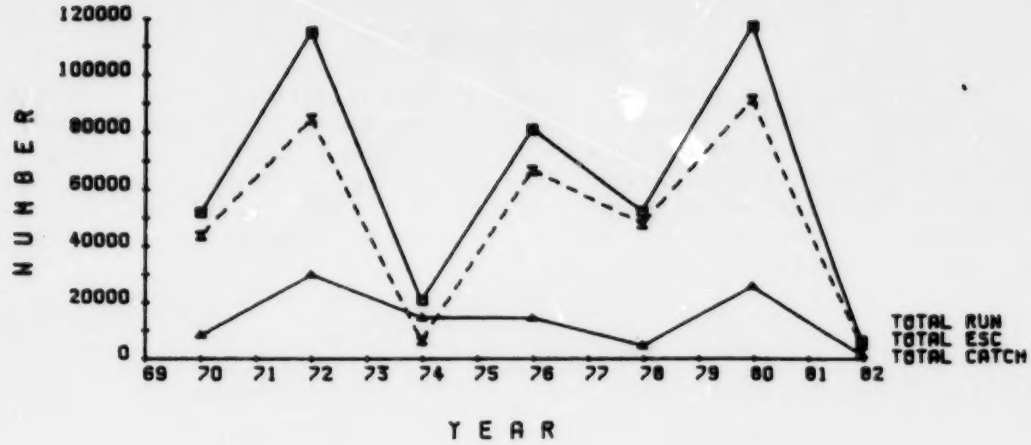
STOCK : LAREDO SOUND

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH LAREDO
1970	51963	8213	43750	15.80	100.00
1971	35352	2402	32950	6.79	100.00
1972	115302	29927	85375	25.96	100.00
1973	11791	2016	9775	17.10	100.00
1974	20717	14366	6350	69.35	100.00
1975	14997	147	14850	0.98	100.00
1976	80767	14266	66501	17.66	100.00
1977	14816	4286	10530	28.93	100.00
1978	52118	4518	47600	8.67	100.00
1979	4236	6	4230	0.13	100.00
1980	116386	25539	90847	21.94	100.00
1981	12195	4145	8050	33.99	100.00
1982	6190	1190	5000	19.22	100.00

The Laredo Sound pink stock was dominant in most even-years between 1970 and 1982. Over this period the mean run size of the even-year stock averaged approximately 2% of the mean run size of all statistical area 6 even-year pink stocks. Estimates of run size and escapement showed extreme variability between 1970 and 1982. The largest run sizes and escapements occured in 1972 and 1980 at approximately 115,000 and 90,000 pieces respectively. Catches exhibited no trend, fluctuating between 6,000 and 90,000 pieces. Harvest rates on the even-year stock over the period from 1970 and 1982 averaged 25%.

The run size of the odd-year Laredo Sound stock averaged 26% of the even-year stock and accounted for approximately 2% of the mean run size of all odd-year pink stocks in statistical area 6. Total run size and escapement of the stock decreased by approximately 70% between 1971 and 1981. Catch remained low fluctuating between 0 and 4,300 pieces. Harvest rates on the odd-year stock over the period 1971 to 1981 averaged 14%.

The average median for entering run timing at the Laredo fishery occurs during second week of August in even years and the first week of August in odd-years.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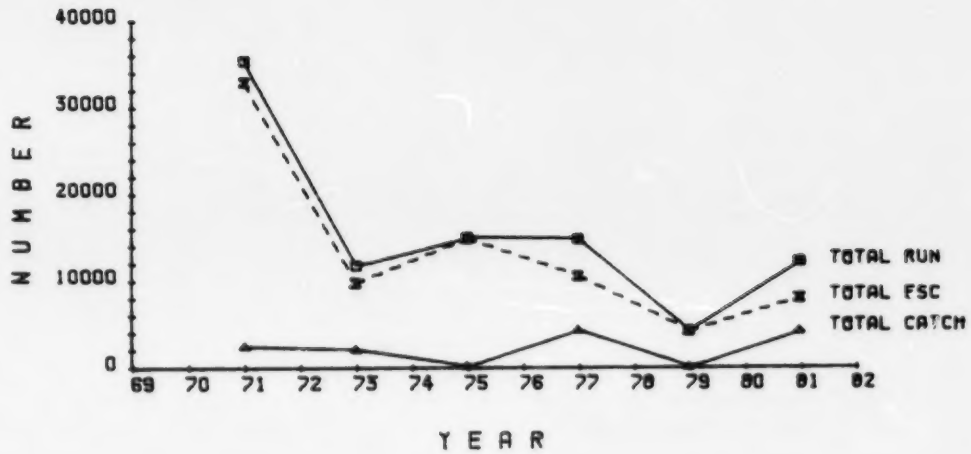
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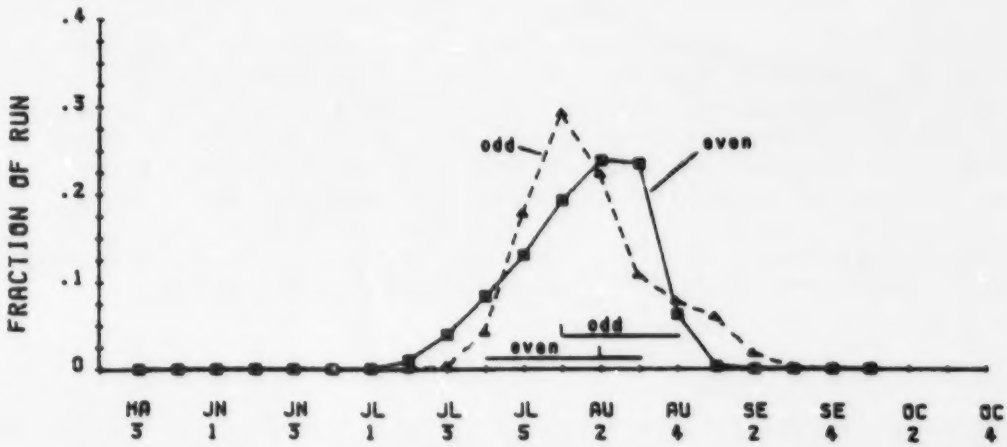
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Fraser-Graham Pink

The Fraser-Graham pink stock aggregation originates from 15 streams and rivers in the area of Fraser Reach, Graham Reach and Tolmu Channel in the central portion of statistical area 6. Escapement to four of these systems, Green Inlet Creek, Khutze River, Scow Bay Creek and Soda Creek, accounts for over 90% of the total escapement of the stock in most years. The Fraser-Graham pink stock is intercepted by the Laredo fishery situated in Laredo Channel at south and of statistical area 6.

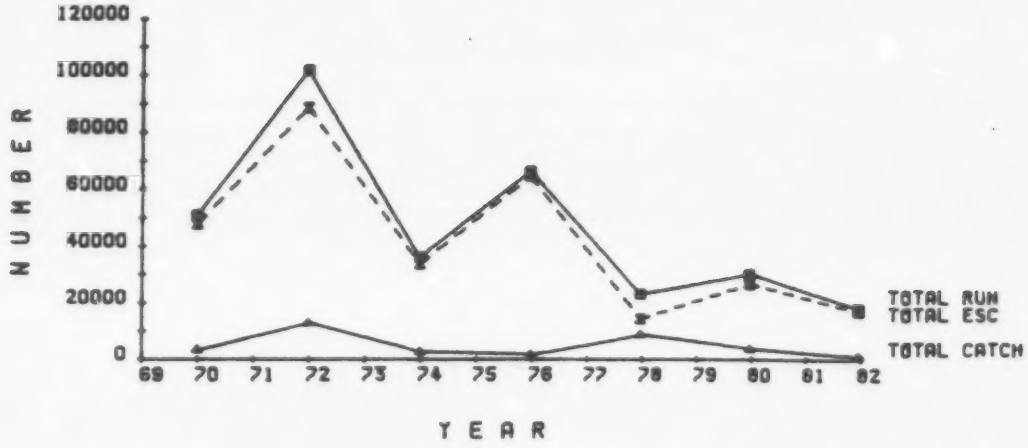
STOCK : FRASER-GRAHAM

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH LAREDO
1970	51068	3268	47800	6.40	100.00
1971	77018	68	76950	0.09	100.00
1972	101925	12852	89074	12.61	100.00
1973	82618	2618	80000	3.17	100.00
1974	36112	2512	33600	6.96	100.00
1975	39776	702	39074	1.76	100.00
1976	66176	1627	64549	2.46	100.00
1977	19544	4205	15339	21.52	100.00
1978	23193	8747	14445	37.72	100.00
1979	86565	17301	69265	19.99	100.00
1980	30248	3615	26633	11.95	100.00
1981	66847	10305	56542	15.42	100.00
1982	17983	983	17000	5.47	100.00

The Fraser-Graham pink were not dominant in either even-or odd-years between 1970 and 1982. The mean run size over the period was approximately 47,000 and 62,000 pieces for even-and odd-years respectively. The even-year run represented approximately 2% of the mean run size of all statistical area 6 even-year pink stocks. The largest run sizes and escapements of the even-year stock occurred in the early 1970's and have since declined discontinuously to a total run size of approximately 18,000 pieces in 1982. Catches of the even-year stock were low throughout the period ranging from 983 to 12,852 pieces. The mean harvest rate on the even-year stock between 1970 and 1982 was 11.9%.

The run size of the odd-year Fraser-Graham pink stock averaged 8% of the the mean run size of all odd-year pink stocks in statistical area 6 between 1971 and 1981. Estimates of run size were variable ranging from approximately 20,000 pieces in 1977 to 85,000 pieces in 1973 and 1979. Catches, although low, did increase in a discontinuous fashion over the period of observation. The mean harvest rate on the odd-year stock between 1971 and 1981 was 10.3%.

The average median for entering run timing at the Laredo fishery occurs during the third week of July for both even-and odd-year stocks.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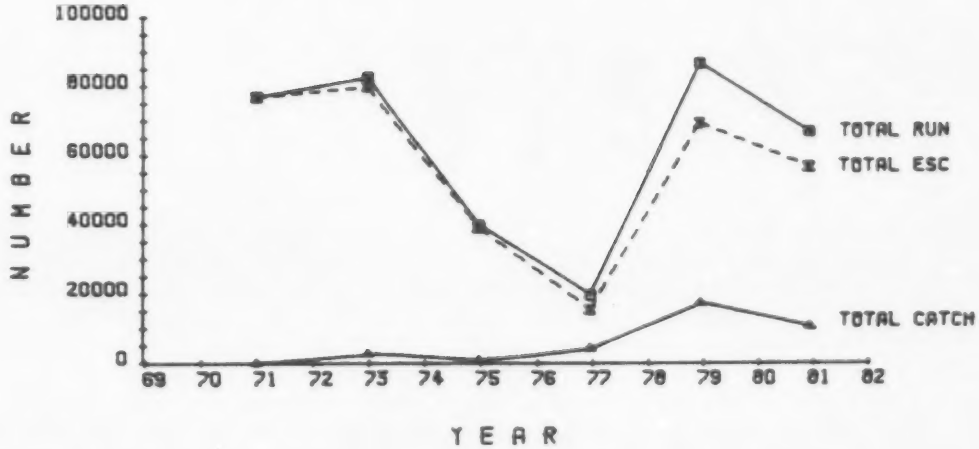
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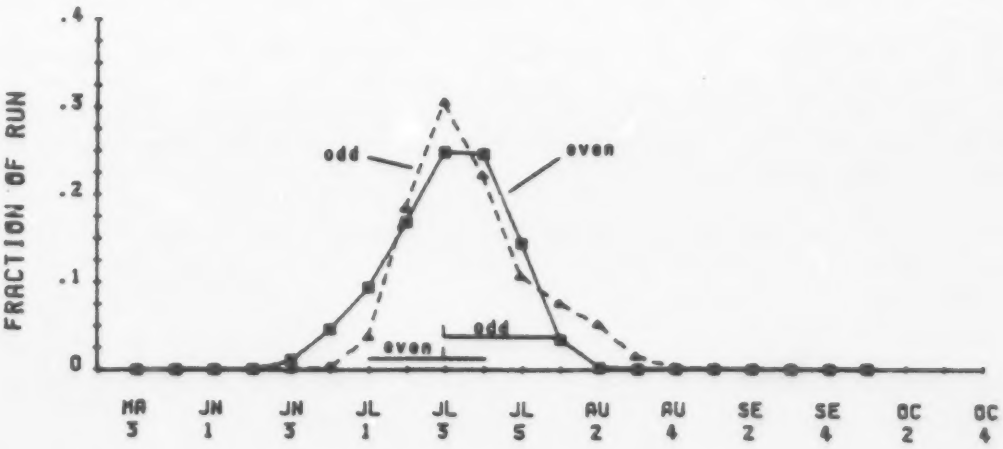
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Aristazabal Island Pink

The Aristazabal Island pink stock aggregation originates from 16 streams and rivers on west side of Aristazabal Island in statistical area 6. The largest pink producing system in the group, Deep Bay Creek, accounts for approximately 30% of the total escapement of the stock in most years. The stock is intercepted by the Laredo fishery situated in Laredo Channel at the south end of statistical area 6.

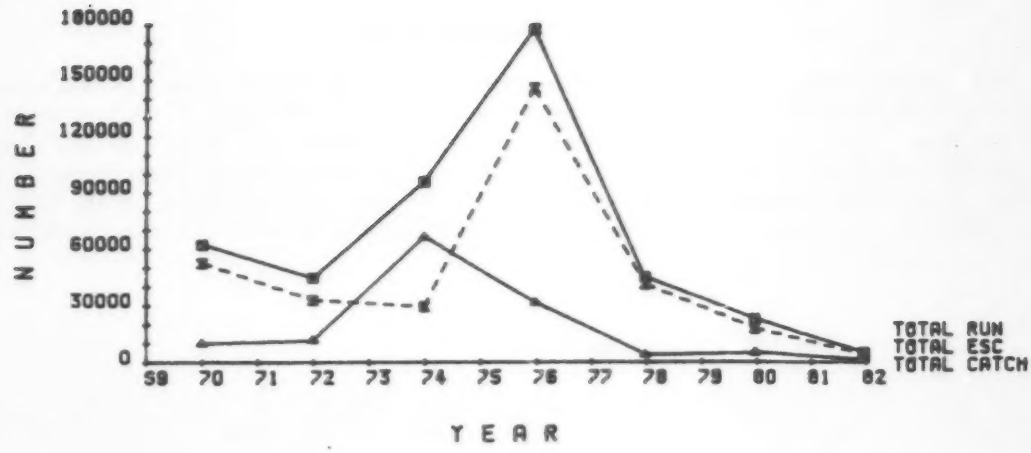
STOCK : ARISTAZABAL ISLAND

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH LAREDO
1970	61998	9799	52199	15.81	100.00
1971	26930	1830	25100	6.80	100.00
1972	44568	11568	33000	25.96	100.00
1973	7497	1282	6215	17.10	100.00
1974	95099	65949	29150	69.35	100.00
1975	11624	114	11510	0.98	100.00
1976	175218	30950	144268	17.66	100.00
1977	7085	2050	5035	28.93	100.00
1978	44891	3891	41000	8.67	100.00
1979	10844	14	10830	0.13	100.00
1980	22580	4955	17625	21.94	100.00
1981	18081	6146	11935	33.99	100.00
1982	4970	955	4015	19.22	100.00

The Aristazabal Island pink were dominant in most even-years between 1970 and 1982. Over this period the mean run size of the even-year Aristazabal Island stock represented approximately 2% of the mean run size of all statistical area 6 even-year pink stocks. Run size and escapement of the even-year stock exhibited a discontinuous trend toward decreasing size between 1970 and 1982. The annual catch from the stock was generally less than 10,000 pieces although it did exceed 65,000 pieces in 1974. The mean harvest rate on the even-year stock between 1970 and 1982 was 25.5%.

The run size of the odd-year Aristazabal Island pink stock averaged approximately 2% of the mean run size of all odd-year pink stocks from statistical area 6 between 1971 and 1981. Estimates of run size were variable ranging from approximately 27,000 pieces in 1971 to 7,000 pieces in 1977. Catches from the odd-year stock were low throughout the period, only once exceeding 3,000 pieces. The mean harvest rate on the odd-year stock between 1971 and 1981 was 14.6%.

The average median for entering run timing at the Laredo fishery occurs during the second and first week of August for the even-and odd-year stocks respectively.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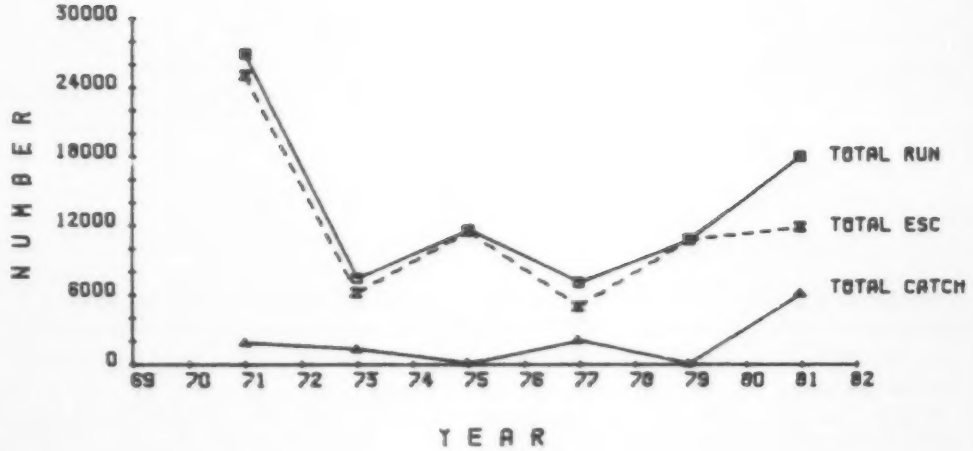
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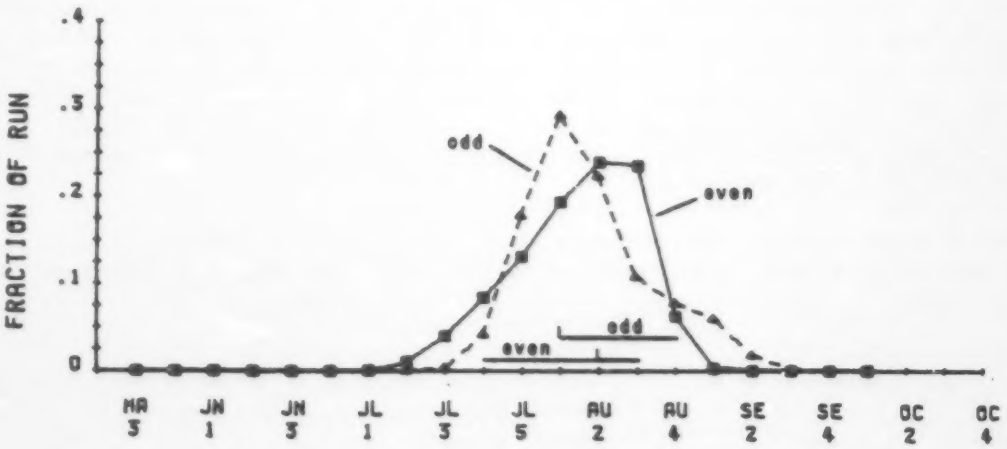
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Laredo-Campania Pink

The Laredo-Campania pink stock aggregation originates from 14 streams and rivers in the west-central portion of Princess Royal Island and on the east side of Aristazabal Island in statistical area 6. Limestone Creek is the largest pink producing system in this group and annually accounts for approximately 16% of the total escapement of the stock. The Laredo-Campania pink stock is intercepted by the Laredo fishery situated in Laredo Channel at the south end of statistical area 6.

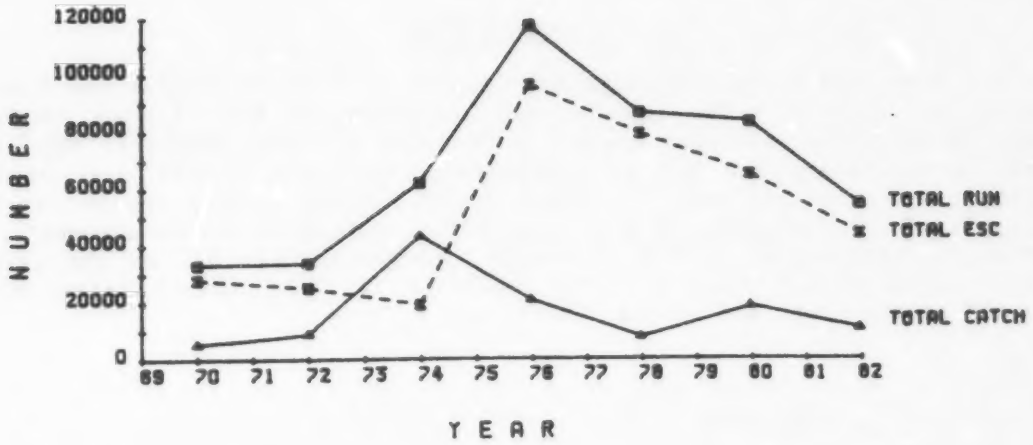
STOCK : LAREDO-CAMPANIA

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH LAREDO
1970	33286	5261	28025	15.80	100.00
1971	38866	2641	36225	6.80	100.00
1972	33966	8816	25150	25.96	100.00
1973	26092	4462	21630	17.10	100.00
1974	62150	43100	19050	69.35	100.00
1975	15502	152	15350	0.98	100.00
1976	116657	20606	96051	17.66	100.00
1977	25011	7236	17775	28.93	100.00
1978	86291	7480	78811	8.67	100.00
1979	62081	81	62000	0.13	100.00
1980	82889	18189	64700	21.94	100.00
1981	75519	25670	49850	33.99	100.00
1982	53911	10361	43550	19.22	100.00

The Laredo-Campania pink were dominant in most even-years between 1970 and 1982. Over this period the mean run size of the even-year Laredo-Campania stock represented approximately 2% of the mean run size of all statistical area 6 even-year pink stocks. Run size and escapement of the even-year stock increased from the early to mid 1970's and subsequently declined continuously through 1982. Catch from the stock was generally less than 20,000 pieces although it did reach 43,000 pieces in 1974. The mean harvest rate on the even year stock between 1970 and 1982 was 25.5%.

The run size and escapement of the odd-year Laredo-Campania stock declined gradually from the early to mid-1970's and subsequently increased through 1982. Over this period the mean run size of the stock averaged approximately 5% of the mean run size of all odd-year stocks in statistical area 6. Catches from the odd-year stock were low throughout most of the period and only once, in 1981, did it exceed 10,000 pieces. The mean harvest rate on the odd-year stock between 1971 and 1981 was 14.6%.

The average median for entering run timing at the Laredo fishery occurs during the second and first week of August for the even-and odd-year stocks respectively.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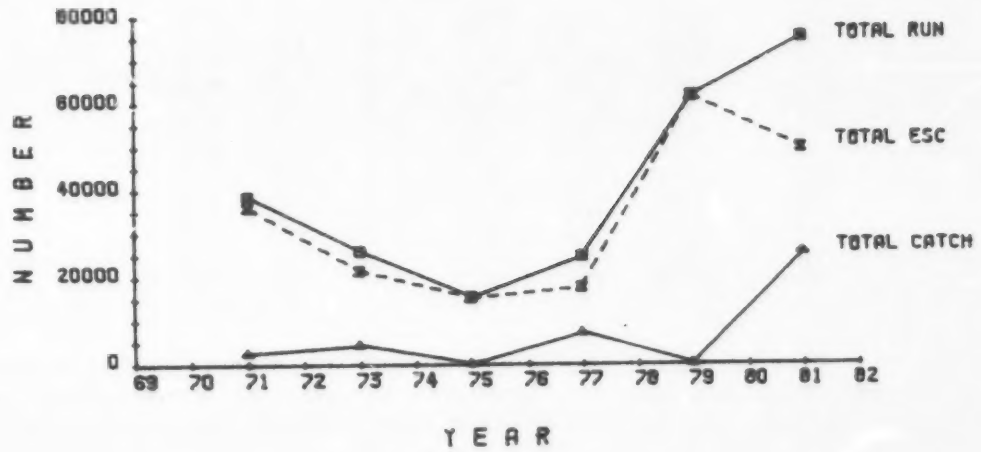
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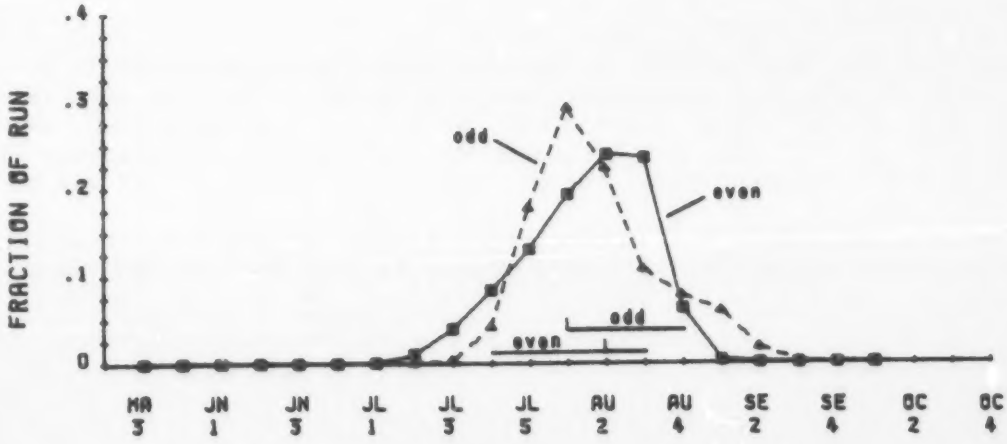
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Area 7 Pink

The Area 7 pink stock aggregation originates from 55 streams and rivers in statistical area 7. The mean annual run size of Area 7 pink represents approximately 10% of the mean annual run size of all pink stocks to the Central Coast in even-years and 30% in odd-years. The four largest pink producing systems in statistical area 7, Kainet Creek, Mussel River, Needas Creek and Salmon Bay Creek, account for more than 40% of the total area escapement. Area 7 pink are intercepted in two fisheries. Approximately 93% of the catch is taken in the Area 7 fishery. The remainder is taken in the Laredo fishery situated at the south end of statistical are 6.

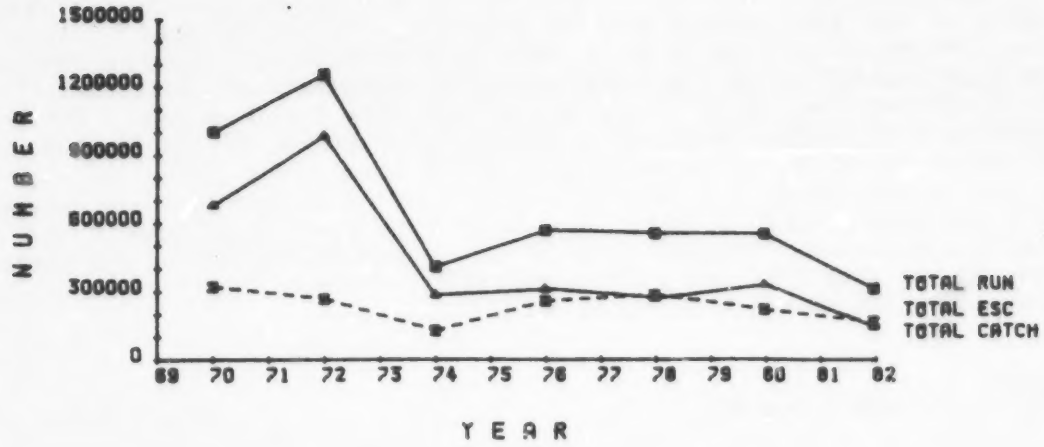
STOCK : AREA 7

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH LAREDO	%CATCH AREA 7
1970	1005114	682231	322883	67.88	8.47	91.53
1971	698387	281885	416502	40.36	0.03	99.97
1972	1256279	988129	268150	78.66	8.52	91.48
1973	545817	363167	182650	66.54	1.52	98.48
1974	408926	283100	125826	69.23	19.28	80.72
1975	260770	158920	101849	60.94	0.93	99.07
1976	568456	310714	257742	54.66	1.26	98.74
1977	559098	293329	265769	52.46	11.94	88.06
1978	555176	269967	285210	48.63	19.82	80.18
1979	925772	494452	431320	53.41	5.87	94.13
1980	552182	331361	220820	60.01	5.02	94.98
1981	956273	697112	259161	72.90	8.68	91.32
1982	312599	145824	166775	46.65	5.06	94.94

The Area 7 pink were not clearly dominant in either even-or odd-years between 1970 and 1982. Run size and catch of the even-year Area 7 stock peaked in 1972 at approximately 1.3 and 1.0 million pieces respectively. Both declined rapidly after 1972 and between 1974 and 1982 run size and catch were approximately 500,000 and 300,000 pieces respectively. There was no trend in the escapement of the stock which fluctuated between 325,000 and 125,000 pieces. The mean harvest rate on the even-year stock between 1970 and 1982 was 60.8%.

Run size and escapement of the odd-year Area 7 stock decreased in the early 1970's and subsequently increased, reaching maximum run size and catch of 956,000 and 697,000 pieces respectively in 1981. Escapement also decreased between 1971 and 1975 and then increased to a maximum of approximately 430,000 pieces in 1979. The mean annual harvest rate on the odd-year stock was 57.8%.

The average median for entering run timing at the Area 7 and Laredo fisheries occurs during the fifth week of July in both even-and odd-years.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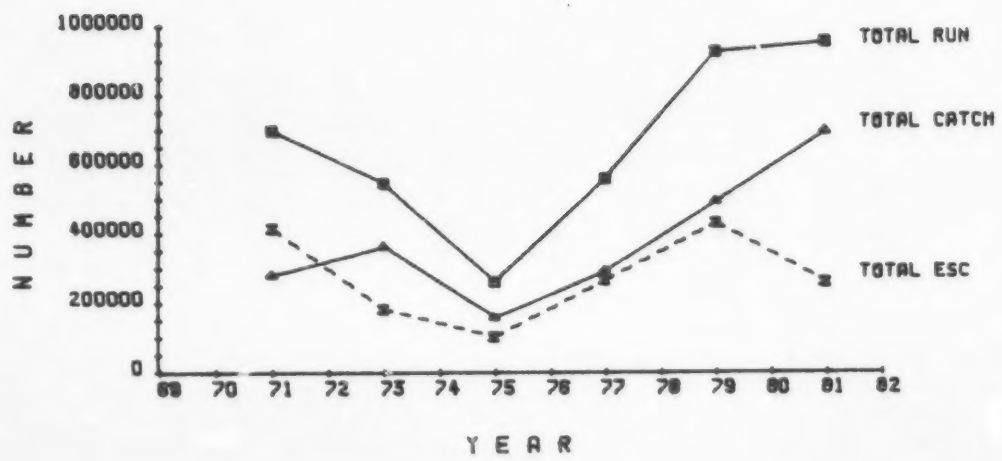
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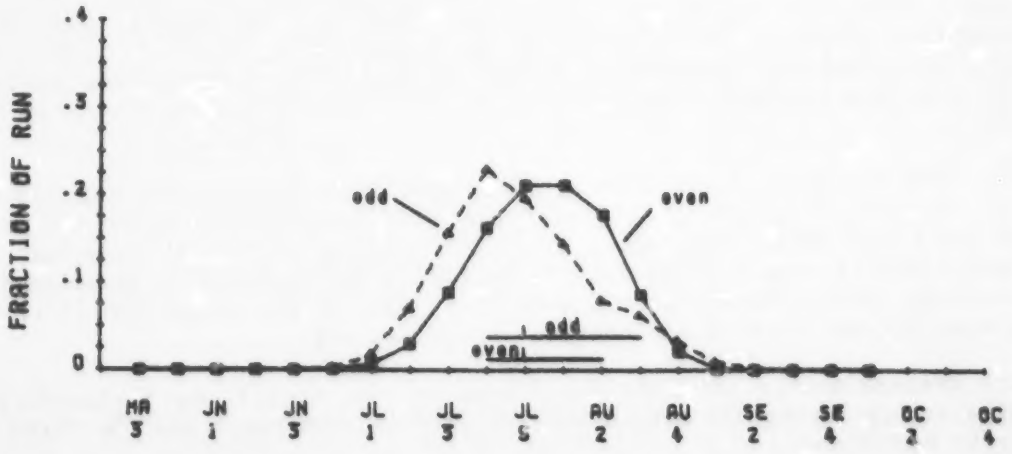
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Dean Open Pink

The Dean Open pink stock aggregation originates from four streams and rivers in the upper portion of Dean Channel in statistical area 8. None of the four systems are considered to be major pink producers. Together they account for approximately 3% of the total even-year escapement and less than 1% of the total odd-year escapement of all statistical area 8 pink stocks. The Kimsquit River is the largest even-year pink producing stream in the Dean Open group averaging 73% of the total escapement of the stock since 1970. The Dean River is the largest odd-year pink producing system. Dean Open pink are harvested in four fisheries, three of which are located in statistical area 8 and one in statistical area 7. Between 1970 and 1982 approximately 29% of the harvest was taken in the Area 7 fishery, 21% in the Fisher-Fitzhugh fishery, 40% in the Dean fishery and 10% in the Bella Coola fishery.

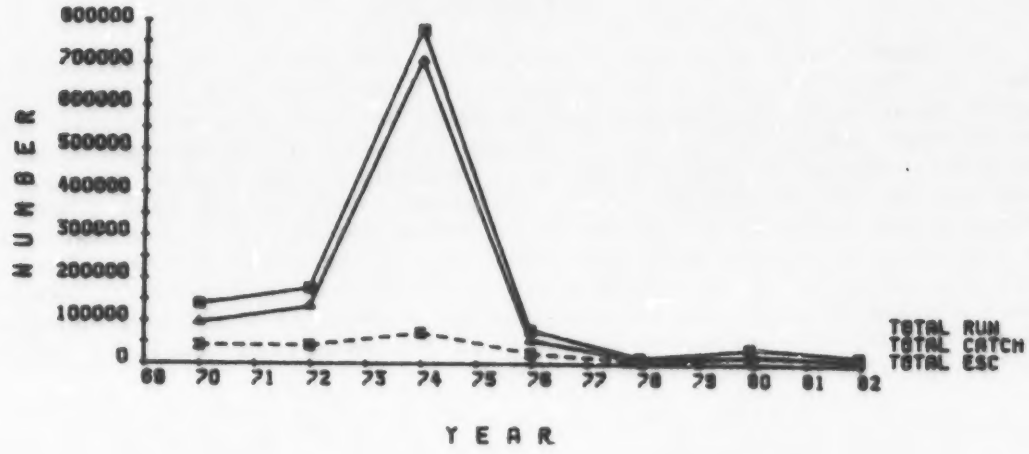
STOCK : DEAN OPEN

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH AREA 7	%CATCH FISHER-FITZ	%CATCH DEAN	%CATCH BELLA COOLA
1970	140872	96975	43897	68.84	51.05	15.60	21.17	12.19
1971	658	358	100	84.79	31.45	1.84	66.25	0.46
1972	178643	134946	43697	75.54	69.18	15.68	12.67	2.47
1973	16247	16172	75	99.54	9.84	6.87	83.00	0.29
1974	782419	710423	71996	90.80	5.72	52.39	3.19	38.70
1975	4045	3420	625	84.55	48.74	6.56	44.46	0.24
1976	78094	54093	24000	69.27	6.94	9.94	80.83	2.29
1977	14729	11599	3130	78.75	11.88	7.36	80.33	0.43
1978	14059	8359	5700	59.46	18.03	11.81	13.75	56.39
1979	15202	7602	7600	50.01	29.09	49.32	16.33	5.26
1980	36905	18905	18000	51.23	28.91	47.04	21.68	2.37
1981	21087	12637	8450	59.93	24.50	40.24	31.70	3.56
1982	19384	9084	10300	46.86	50.58	6.09	40.99	2.34

Dean Open pinks were dominant in even-years in the early and mid 1970's after which there was no clear dominance in either even-or odd-years. The loss of the dominance pattern was the result of management actions designed to rebuild the odd-year stock in conjunction with an apparent decrease in productivity of the even-year stock. Between 1970 and 1982 the mean run size of the even-year Dean Open stock represented approximately 6.2% of the mean run size of all statistical area 8 even-year pink stocks. Run size and catch of the even-year stock increased in the early 1970's reaching a maximum of approximately 780,000 and 710,000 pieces respectively in 1974. Both subsequently declined and remained very low through 1982. Escapement estimates followed the same pattern. The mean annual harvest rate of the even-year stock was 66%.

The mean run size of the odd-year Dean Open stock represented approximately 1.2% of the mean run size of all odd-year pink stocks in statistical area 8 between 1971 and 1981. Run size, catch and escapement of the odd-year stock increased discontinuously between 1971 and 1981. The increase in escapement was most apparent with 1981 estimates more than eight times those for 1971. The mean annual harvest rate of the odd-year stock was 76%.

The average median entering run timing at the Area 7 and Fisher-Fitzhugh fisheries occurs during the second week of July in even-years and the third week of July in odd-years.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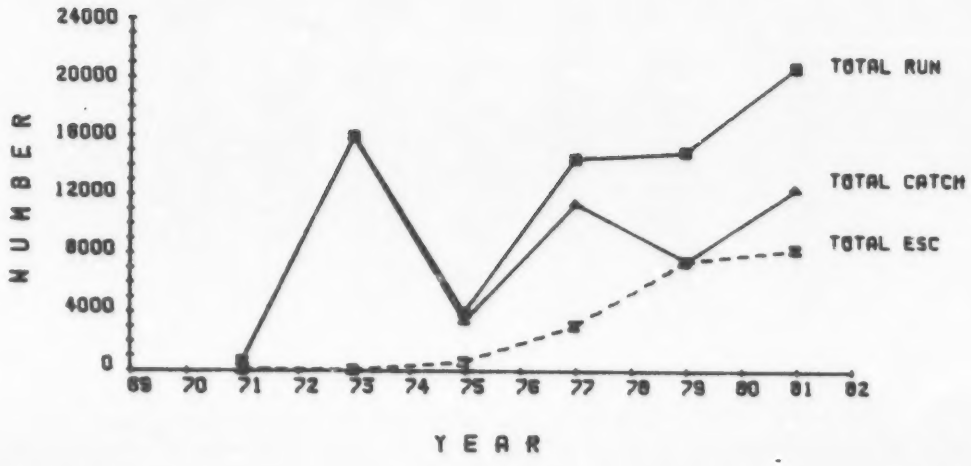
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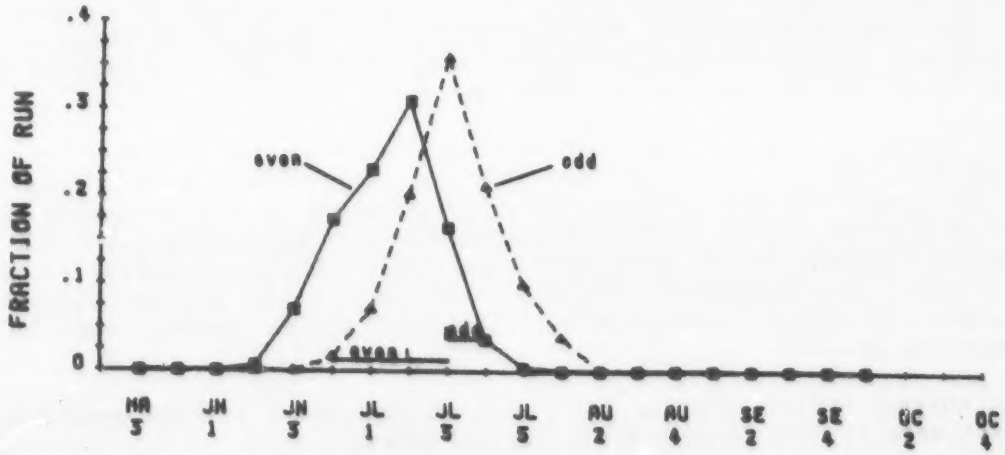
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Dean Closed Pink

The Dean Closed pink stock aggregation originates from seven streams and rivers in the middle and lower portions of Dean Channel in statistical area 8. None of these seven systems are considered to be major pink producers. Together they account for approximately 1% of the total even-year escapement and 6% of the total odd-year escapement of all statistical area 8 pink stocks. Elcho Creek is the largest odd-year pink producing system in the Dean Closed group, averaging approximately 40% of the total escapement of the stock. Escapement of the even-year stock is spread more equally over the seven systems. Dean Closed pinks are harvested in two fisheries, one of which is located in statistical area 7 and the other in statistical area 8. Between 1970 and 1982 approximately 58% of the harvest was taken in the Area 7 fishery and remaining 42% in the statistical area 8 Fisher-Fitzhugh fishery.

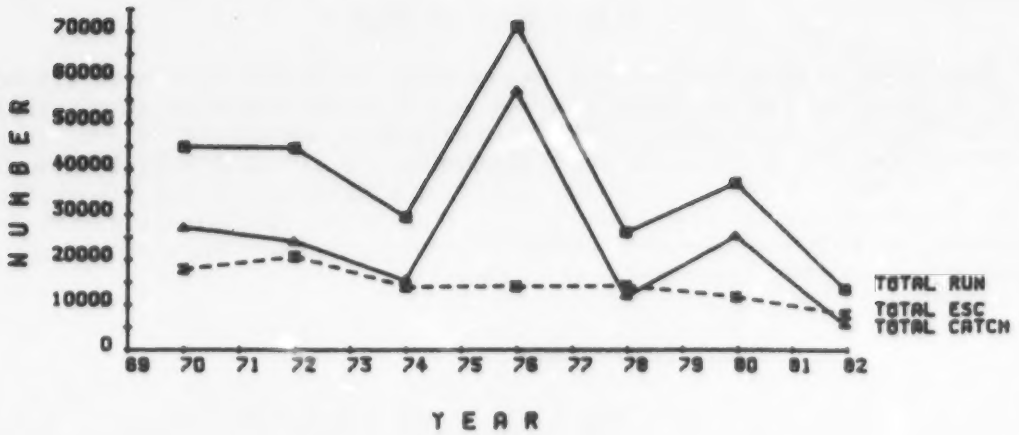
STOCK : DEAN CLOSED

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH AREA 7	%CATCH FISHER-FITZ
1970	44983	27084	17899	60.21	49.99	50.01
1971	7670	770	6900	10.04	91.04	8.96
1972	44775	24026	20749	53.66	61.89	38.11
1973	5321	1171	4150	22.00	80.27	19.73
1974	29341	15342	13999	52.29	32.53	67.47
1975	19317	5567	13750	28.82	75.45	24.55
1976	70966	56867	14099	80.13	51.18	48.82
1977	30563	9413	21150	30.80	91.77	8.23
1978	26038	11889	14149	45.66	31.48	68.52
1979	154614	74363	80251	48.10	54.25	45.75
1980	36849	25149	11700	68.25	22.00	78.00
1981	223920	155520	68400	69.45	42.45	57.55
1982	13486	5541	7945	41.09	72.32	27.68

Dean Closed pinks were dominant in even-years in the early and mid 1970's after which the pattern reversed to one of odd-year dominance. The change was likely the result of management actions designed to rebuild the odd-year stock in conjunction with an apparent gradual decline in productivity of the even-year stock. Between 1970 and 1982 the mean run size of the even-year Dean Closed stock represented approximately 6.2% of the mean run size of all statistical area 8, even-year pink stocks. Run size catch and escapement of the even year stock declined discontinuously to a 1982 level of less than half that of 1970. The mean annual harvest rate of the even-year stock was 57%.

The mean run size of the odd-year Dean Closed pink stock represented approximately 1.2% of the mean run size of all odd-year pink stocks from statistical area 8 between 1971 and 1981. Run size, catch and escapement of the odd-year Dean Closed stock increased almost continuously between 1971 and 1981 although more rapidly in the late 1970's and early 1980's. The 1981 estimates of run size and escapement exceeded the 1971 estimates by factors of approximately 29 and 9 respectively. The mean annual harvest rate on the odd-year stock was 35%.

The average median entering run timing at the Area 7 fishery occurs during the fourth week of July in both even- and odd-years.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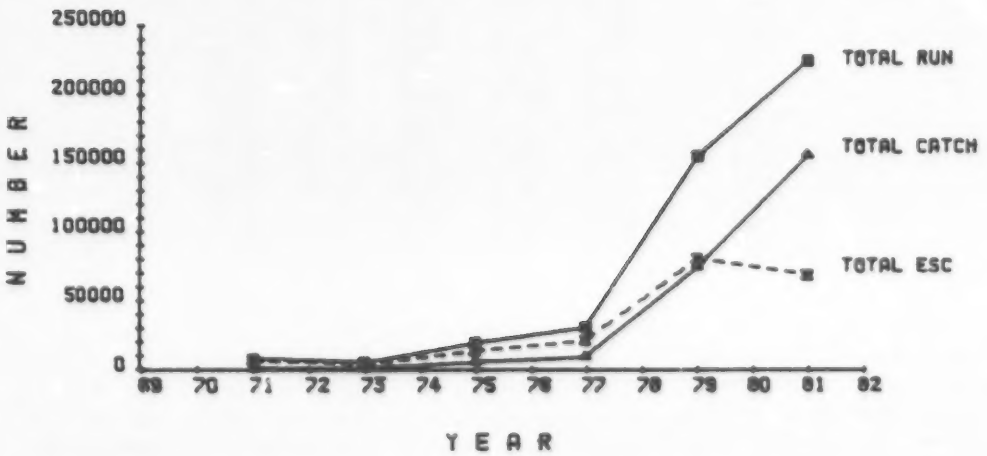
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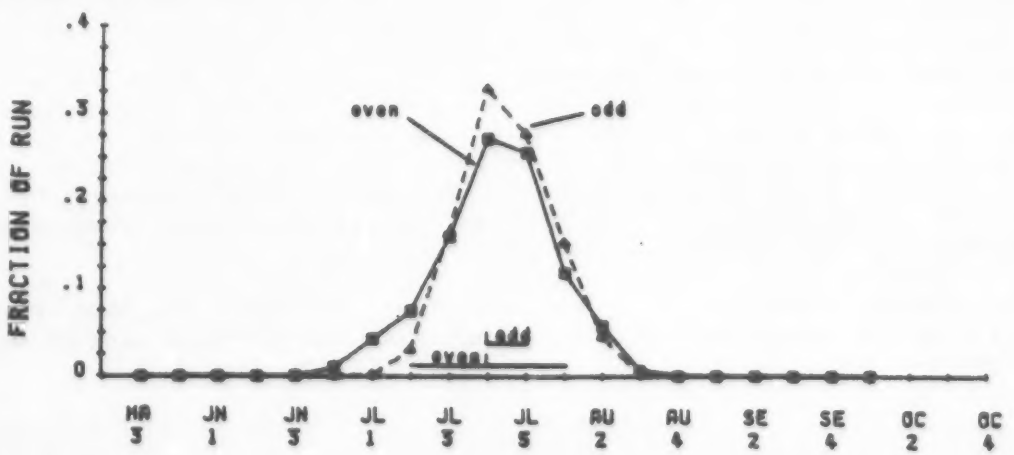
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Fisher-Fitzhugh Pink

The Fisher-Fitzhugh pink stock aggregation originates from nine streams and rivers in the vicinity of Fisher Channel and Fitzhugh Sound in statistical area 8. Together the nine systems account for approximately 8% of the even-year escapement and 23% of the odd-year escapement of all statistical area 8 pink stocks. The Koeye River is the only major pink producer in the Fisher-Fitzhugh group. Escapement to the Koeye River represents approximately 85% of the escapement of even-and odd-year Fisher-Fitzhugh stocks. Fisher-Fitzhugh pinks are harvested in the Fisher-Fitzhugh fishery.

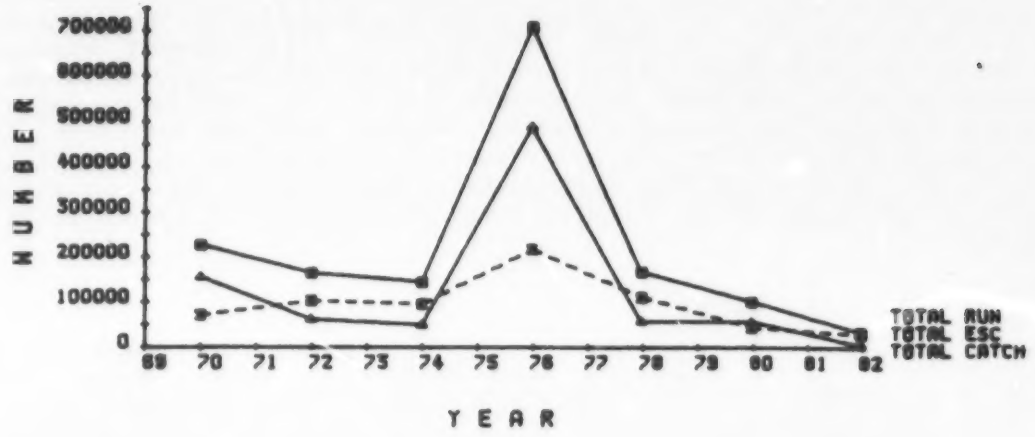
STOCK : FISHER-FITZHUGH

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH FISHER-FITZ
1970	225984	155084	70900	68.63	100.00
1971	164330	35031	129299	21.32	100.00
1972	165026	61527	103499	37.28	100.00
1973	104969	37320	67649	35.55	100.00
1974	144185	48685	95500	33.77	100.00
1975	133447	74698	58750	55.98	100.00
1976	700998	484650	216348	69.14	100.00
1977	154327	12626	141700	8.18	100.00
1978	167126	56377	110750	33.73	100.00
1979	169152	81402	87750	48.12	100.00
1980	100446	56296	44150	56.05	100.00
1981	667835	521324	146510	78.06	100.00
1982	33599	4499	29100	13.39	100.00

Fisher-Fitzhugh pink exhibited no clear pattern of either even-or odd-year dominance between 1970 and 1982. Over this period the mean run size of the even-year stock represented approximately 7.7% of the mean run size of all statistical area 8 even-year pink stocks. Run size and catch of the even-year stock showed a gradual, discontinuous decline between 1970 and 1982. The maximum run size and catch occurred in 1976 at approximately 701,000 and 485,000 pieces respectively. Escapement estimates have also declined from approximatly 500,000 in 1970 to 160,000 in 1982. The mean harvest rate for the even-year stock was 45%.

The mean run size of the odd-year Fisher-Fitzhugh pink stock represented approximately 23.0% of the mean run size of all odd-year pink stocks to statistical area 8 between 1971 and 1981. Run size and catch of the odd-year stock increased very gradually between 1971 and 1979. Following 1979, there was a rapid increase in run size and catch to 1981 levels of approximately 670,000 and 520,000 pieces respectively. There was no apparent trend in escapement. The mean harvest rate for the odd-year stock was 41%.

The average median entering run timing at the Fisher-Fitzhugh fishery occurs during the fourth week of July in even-years and the third week of August in odd-years.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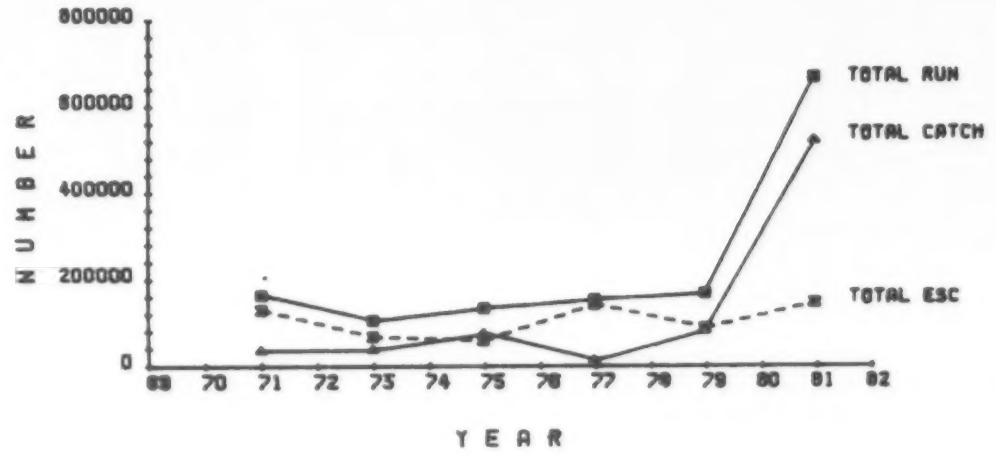
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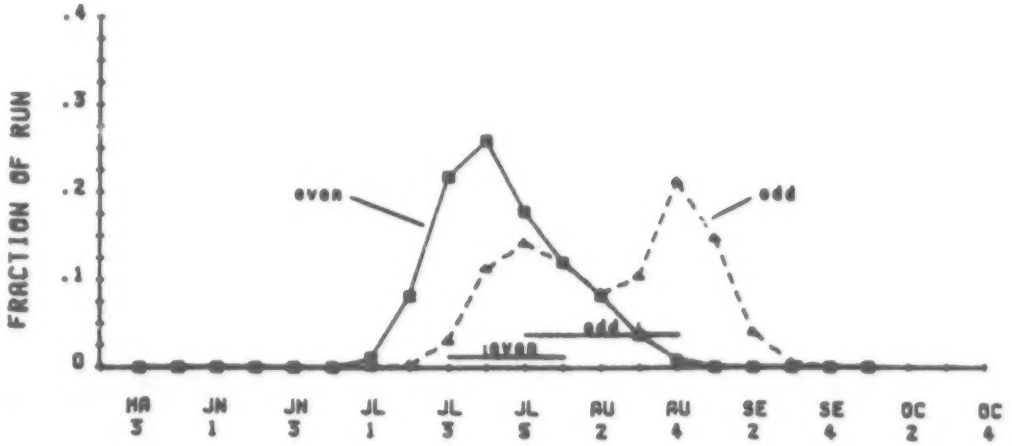
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Bentinck Pink

The Bentinck pink stock aggregation originates from eight tributaries of the North and South Bentinck Arm in statistical area 8. This is the largest pink production system in statistical area 8, accounting for approximately 83% of the total even-year escapement and 56% of the total odd-year escapement to the area. The Bentinck pink stock is totally dominated by returns to the Bella Coola River which represents approximately 98% of the total escapement of both even-and odd-year stocks in most years. Bentinck pink are harvested in three fisheries, two of which are located in statistical area 8 and one in statistical area 7. Between 1970 and 1982 approximately 30% of the harvest was taken in the Area 7 fishery, 50% in the Fisher-Fitzhugh fishery and 20% in the Bella Coola fishery.

STOCK : BENTINCK

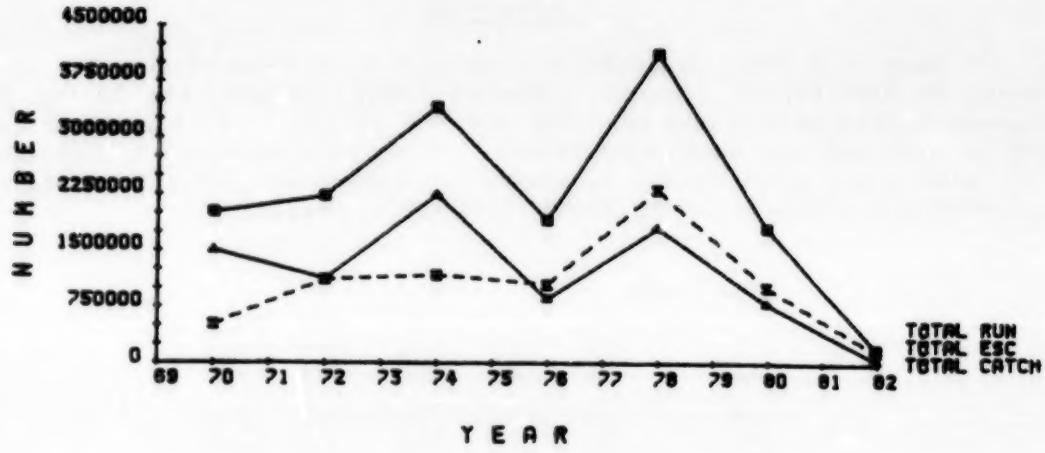
YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH AREA 7	%CATCH FISHER-FITZ	%CATCH BELLA COOLA
1970	2002320	1491420	510900	74.48	13.78	66.28	19.94
1971	33791	3191	30600	9.44	82.59	12.53	4.88
1972	2231943	1119195	1112748	50.14	32.18	54.88	12.94
1973	35743	5743	30000	16.07	21.61	43.47	34.92
1974	3383774	2221176	1162598	65.64	11.35	66.49	22.16
1975	54214	22439	31775	41.39	62.90	34.77	2.33
1976	1896044	852294	1043750	44.95	9.21	51.20	39.59
1977	510035	75343	434692	14.78	40.48	40.00	19.52
1978	4079262	1785783	2293479	43.78	6.48	68.17	25.35
1979	1462434	594708	867726	40.67	14.24	79.82	5.94
1980	1796849	785823	1011026	43.73	17.31	62.39	20.30
1981	1384914	976414	408500	70.50	16.37	57.02	26.60
1982	199535	42260	157274	21.18	62.17	12.25	25.58

Bentinck pink were dominant in even-years during the 1970's. Over that period 87% of the total pink run occurred in even-years. Following 1980, however, the pattern of even-year dominance disappeared. The change was primarily the result of a large decrease in the size of the even-year Bella Coola stock in 1982 coincident with an increase in size of the odd-year stock in 1981.

The mean run size of the even-year Bentinck pink stock represented approximately 77.8% of the mean run size of all statistical area 8 even-year pink stocks between 1970 and 1982. There was no trend in run size or catch of the even-year Bentinck pink stock between 1970 and 1978. During this period the total run size varied between 1.9 and 4.1 million pieces while escapement increased from 511,000 pieces in 1970 to over two million pieces in 1978. After 1978 however, run size, catch and escapement decreased rapidly to approximately 200,000, 42,000 and 157,000 pieces respectively in 1982. The mean harvest rate for the even-year stock between 1970 and 1982 was 49%.

The mean run size of the odd-year Bentinck pink stock represented approximately 57.5% of the mean run size of all odd-year pink stocks from statistical area 8 between 1971 and 1981. Run size, catch and escapement of the odd-year Bentinck pink stock were low between 1971 and 1975 and then increased rapidly reaching a maximum run size of approximately 1.5 million pieces in 1979. The mean harvest rate for the odd-year stock between 1971 and 1981 was 32.1%.

The average median entering run timing at the Area 7 and Fisher-Fitzhugh fisheries occurs in the third week of July in both even-and odd-years.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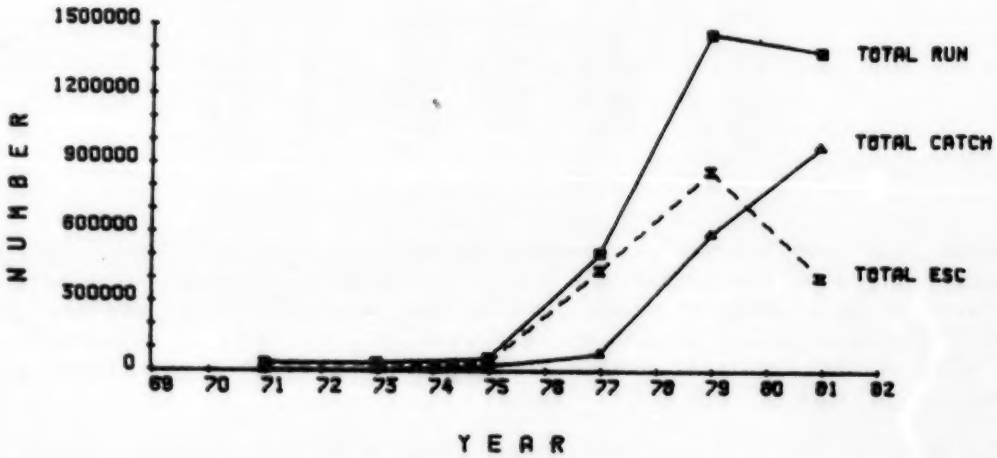
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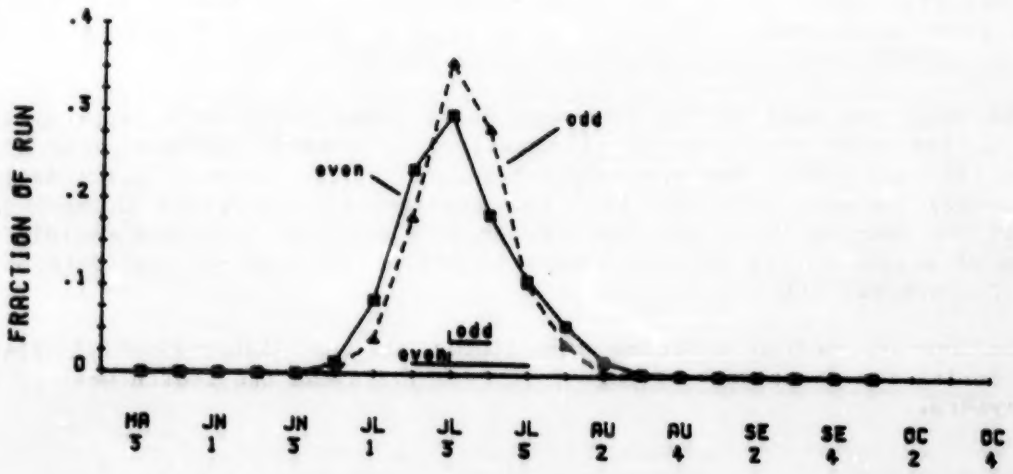
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Burke Pink

The Burke pink stock aggregation originates from three tributaries of Burke Channel in statistical area 8. One of these systems, the Kwatna River, dominates receiving approximately 97% and 99% of the total escapement of the stock in even-and odd-years respectively. Burke pink account for approximately 6% of total statistical area 8 escapement in even-years and 15% in odd-years. Burke pink are harvested in the Fisher-Fitzhugh fishery.

STOCK : BURKE

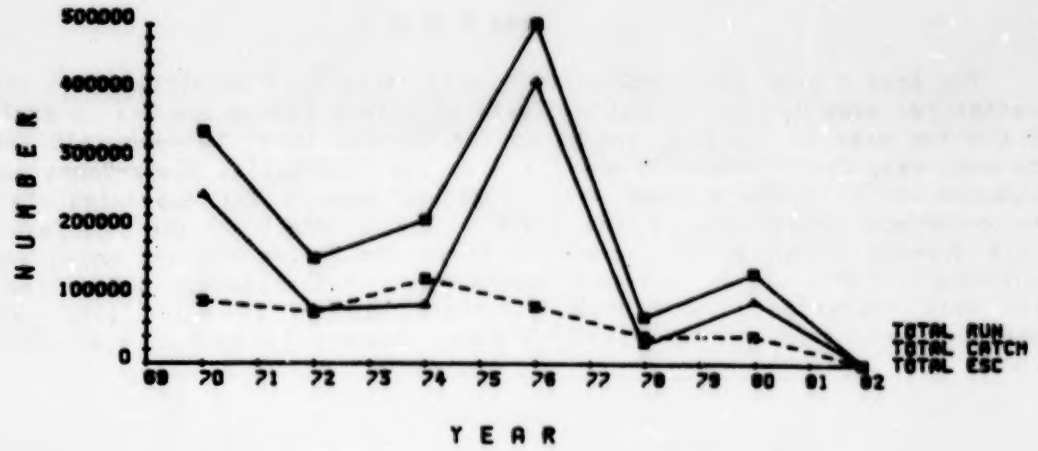
YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH FISHER-FITZ
1970	341570	249070	92500	72.92	100.00
1971	91604	1205	90399	1.32	100.00
1972	133450	80051	75400	51.50	100.00
1973	69824	4823	65001	6.91	100.00
1974	212364	87063	125301	41.00	100.00
1975	51191	5992	45200	11.70	100.00
1976	496969	412969	84000	83.10	100.00
1977	42584	1984	40600	4.66	100.00
1978	69610	29110	40500	41.82	100.00
1979	125222	45222	80000	36.11	100.00
1980	134270	92770	41500	69.09	100.00
1981	286809	182309	104501	63.56	100.00
1982	440	90	350	20.47	100.00

Burke pink were dominant in even-years during the 1970's. Over this period approximately 70% of the total pink run occurred in even-years. The pattern of even-year dominance began to break down in the late 1970's and was not evident between 1980 and 1982. The change was primarily the result of a large decrease in the size of the even-year Kwatna stock beginning in 1978 coincident with an increase in the size of the odd-year stock.

The mean run size of the even-year Burke stock represented approximately 7.0% of the mean run size of all statistical area 8 even-year pink stocks between 1970 and 1980. There was a gradual, discontinuous decrease in run size, catch and escapement of the even-year stock between 1970 and 1982. Run size varied from approximately 500,000 pieces in 1976 to only 440 pieces in 1982. The mean harvest rate for the even-year stock was 54%.

The mean run size of the odd-year Burke stock represented approximately 11.0% of the mean run size of all statistical area 8 odd-year pink stocks between 1971 and 1981. Run size and escapement of the odd-year stock declined continuously between 1971 and 1977 and subsequently increased through 1981. Catch of the odd-year stock was low through 1977 and then increased rapidly to a maximum of approximately 180,000 pieces in 1981. The mean harvest rate on the odd-year stock was 21%.

The average medium entering run timing at the Fisher-Fitzhugh fishery occurs during the first week of August in even-years and the fourth week of July in odd-years.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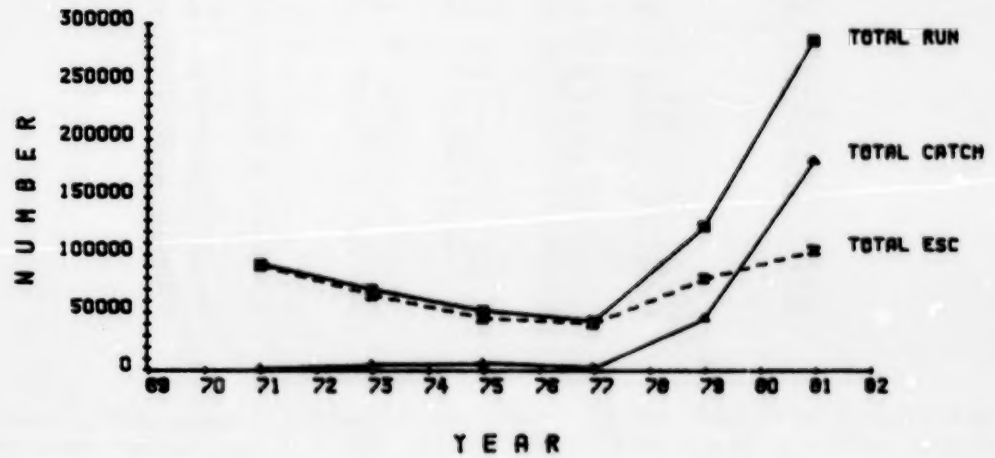
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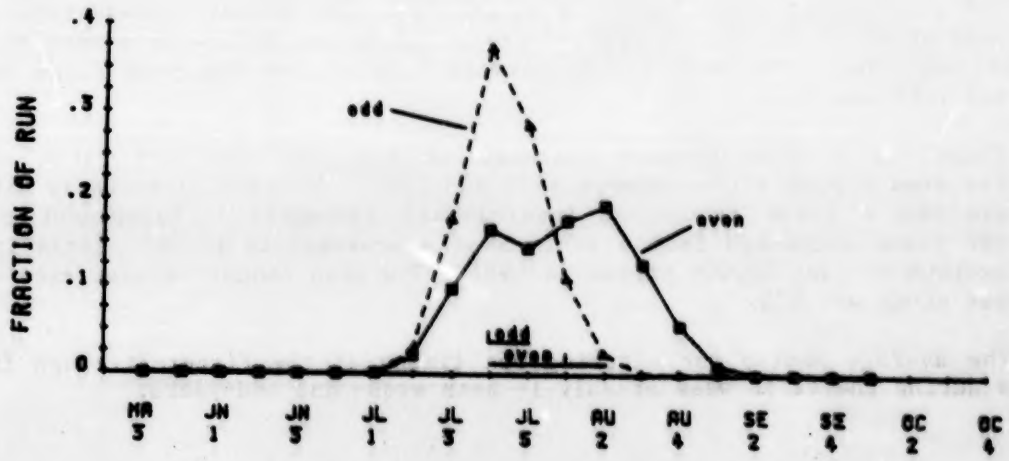
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Area 9 Pink

The Area 9 pink stock aggregation originates from 20 streams and rivers in statistical area 9. The annual run size of Area 9 pink stock was generally < 5% of the run size of all pink stocks to the Central Coast between 1970 and 1982. The even-year Area 9 stock is dominated by the Chuckwalla, Clark-Young and Niel, Johnston and Kilbella systems which together account for approximately 91% of the even-year escapement of the stock. The strength of the odd-year Area 9 stock depends primarily on Chuckwalla River and Johnston Creek which represent approximately 85% of the odd-year escapement. Approximately 80% of the Area 9 pink were harvested in the Area 9 fishery between 1970 and 1982 while the remainder were taken in the Fisher-Fitzhugh fishery located in statistical area 8.

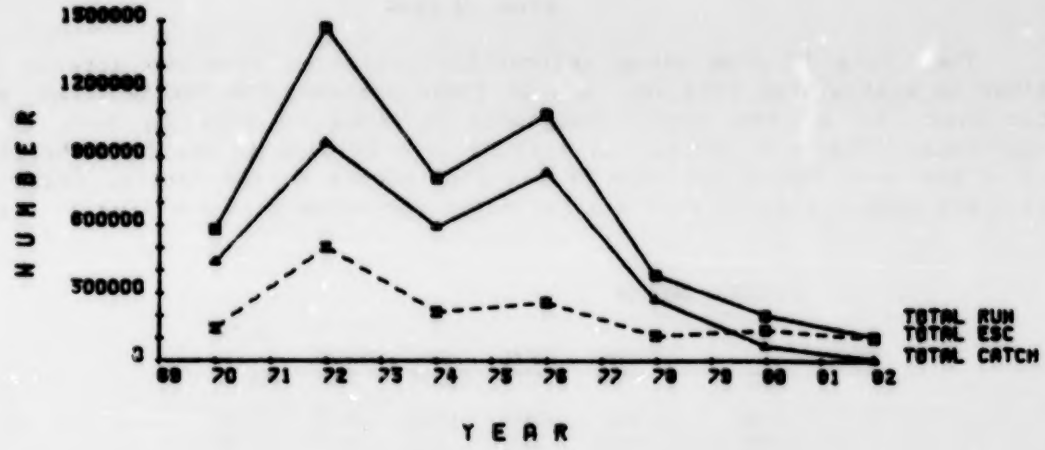
STOCK : AREA 9

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH FISHER-FITZ	%CATCH AREA 9
1970	581477	437303	144175	75.21	55.11	44.89
1971	58780	24575	34205	41.81	0.69	99.31
1972	1467379	964928	502451	65.76	15.28	84.72
1973	90850	81085	9765	89.25	2.25	97.75
1974	803431	588579	214852	73.26	14.20	85.80
1975	111500	24350	87150	21.84	13.84	86.16
1976	1085744	829645	256099	76.41	21.61	78.39
1977	275646	228046	47600	82.73	0.39	99.61
1978	378059	268407	109652	71.00	3.85	96.15
1979	85017	35667	49350	41.95	19.03	80.97
1980	198880	63079	135801	31.72	64.75	35.25
1981	252499	159448	93051	63.15	23.01	76.99
1982	105688	5688	100000	5.38	50.51	49.49

Area 9 pink were dominant in even-years between 1970 and 1979. During that period the even-year runs were approximately eight times larger than those in odd-years. The pattern of even-year dominance disappeared after 1979 and was replaced by a new pattern of odd-year dominance. The run size, catch and escapement of the even-year Area 9 stock declined discontinuously beginning in 1970 and all reached their lowest level in 1982. The annual harvest rate on the even-year stock declined from approximately 70% in the 1970's to a mean on 18.5% in 1980 and 1982. The mean annual harvest rate on the even-year stock between 1970 and 1982 was 57%.

There was a discontinuous increase in the run size and catch of the odd-year Area 9 pink stock between 1971 and 1981. However, associated with the increase was a large amount of inter-annual variation. Escapement of the odd-year stock increased from a minimum of approximately 10,000 pieces in 1973 to a maximum of over 90,000 pieces in 1981. The mean annual harvest rate on the odd-year stock was 57%.

The average median for entering run timing at the Fisher-Fitzhugh fishery occurs during the fifth week of July in both even- and odd-years.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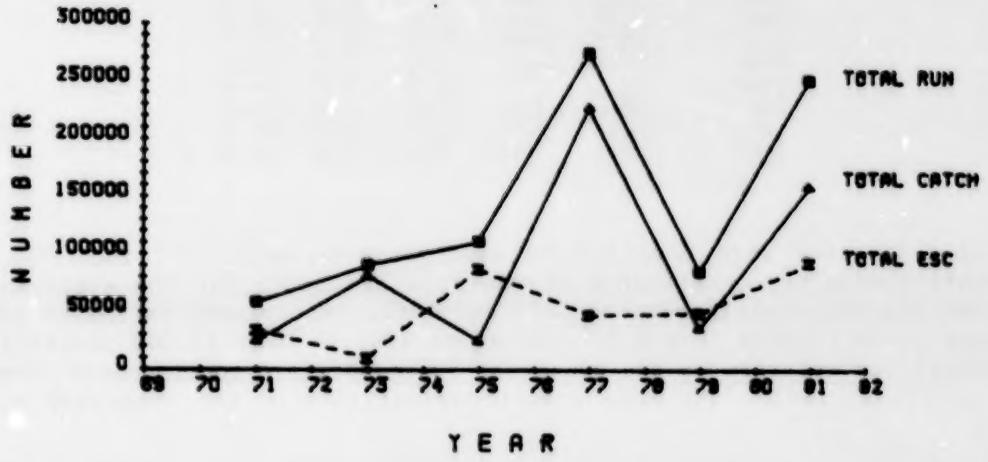
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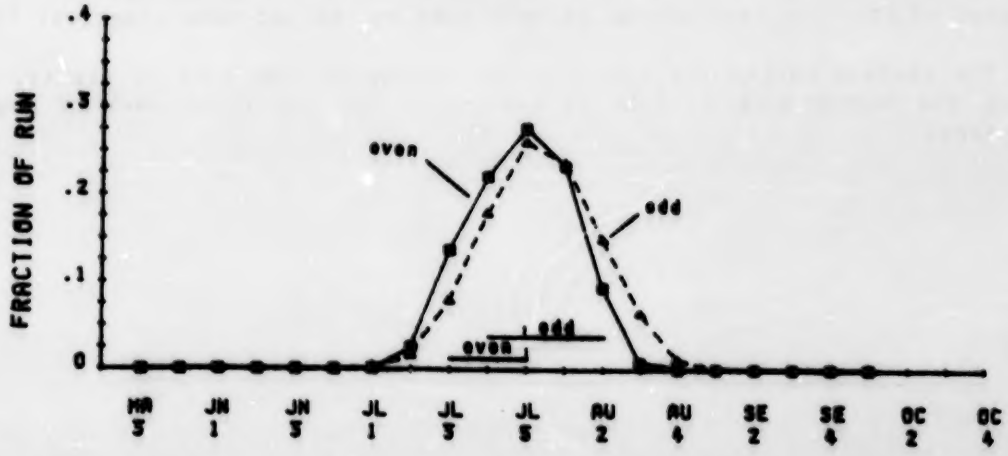
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Area 10 Pink

The Area 10 pink stock aggregation orginates from two streams and one river in statistical area 10. One of these systems, the Nekite River, accounts for over 98% of the total escapement of Area 10 pink in both even- and odd-years. The mean annual run size of Area 10 pink is small accounting for < 1% of the mean annual run size of all pink stocks to the Central Coast between 1970 and 1982. Area 10 pink are harvested exclusively in the Area 10 fishery.

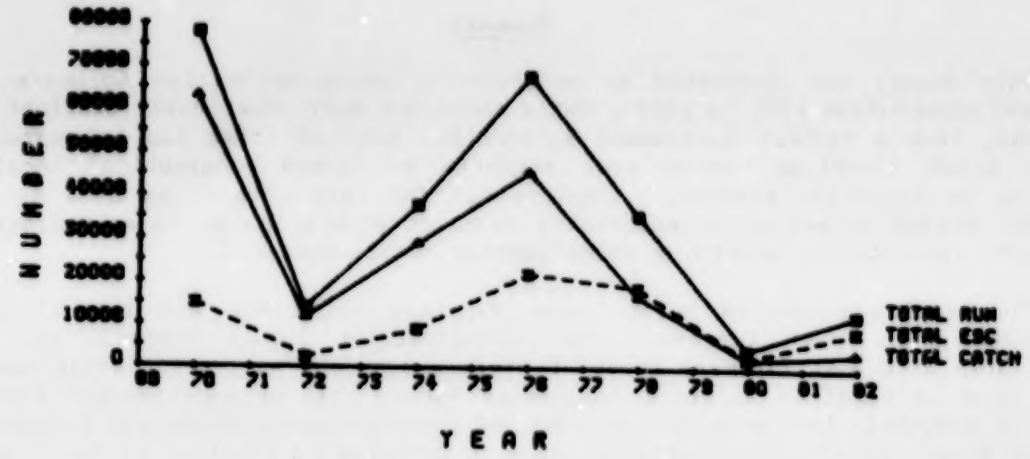
STOCK : AREA 10

YEAR	TOTAL RUN	TOTAL CATCH	TOTAL ESCAPE	HARVEST RATE	%CATCH AREA 10
1970	78456	63456	15000	80.88	100.00
1971	6632	2632	4000	39.69	100.00
1972	14218	11693	2525	82.24	100.00
1973	12063	7033	5030	58.30	100.00
1974	38140	29140	9000	76.40	100.00
1975	3540	2240	1300	63.28	100.00
1976	68135	46035	22100	67.56	100.00
1977	42519	22419	20100	52.73	100.00
1978	35933	16933	19000	47.12	100.00
1979	42016	11766	30250	28.00	100.00
1980	4566	2066	2500	45.25	100.00
1981	116244	51207	65037	44.05	100.00
1982	12944	3913	9031	30.23	100.00

Area 10 pink were dominant in even-years between 1970 and 1976 and in odd-years thereafter. Estimates of run size and catch for the even-year stock declined discontinuously between 1970 and 1982. Escapement estimates exhibited no clear trend varying from 2,500 pieces in 1980 to over 22,000 pieces in 1976. The annual harvest rate on the even-year stock declined continuously from 81% in 1970 to 30% in 1982. The mean annual harvest rate on the even-year stock was 61%.

Run size, catch and escapement of the odd-year Area 10 pink stock were low between 1971 and 1975 and then increased rapidly through 1981. Run size increased by a factor of 18 between 1971 and 1981 while escapement increased by a factor of 16. The mean annual harvest rate on the odd-year stock was 41%.

The average median for entering run timing at the Area 10 fishery occurs during the fourth week of July in even-years and the first week of August in odd-years.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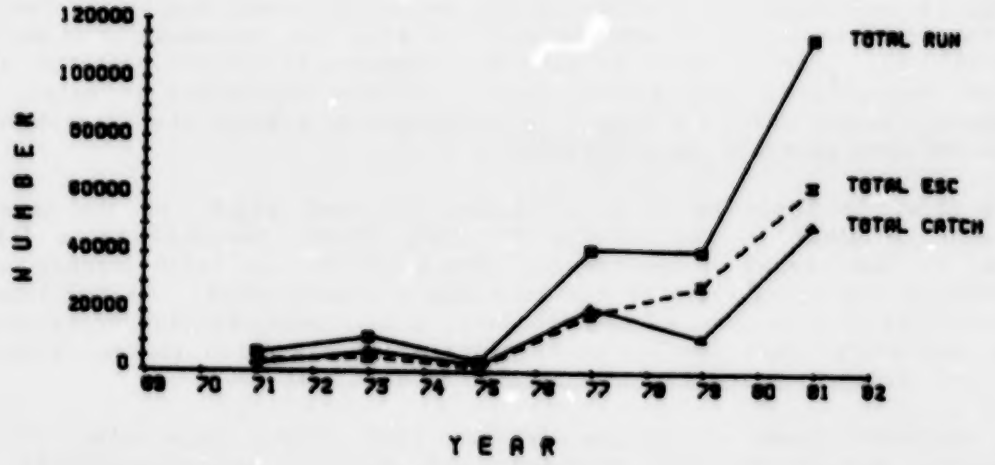
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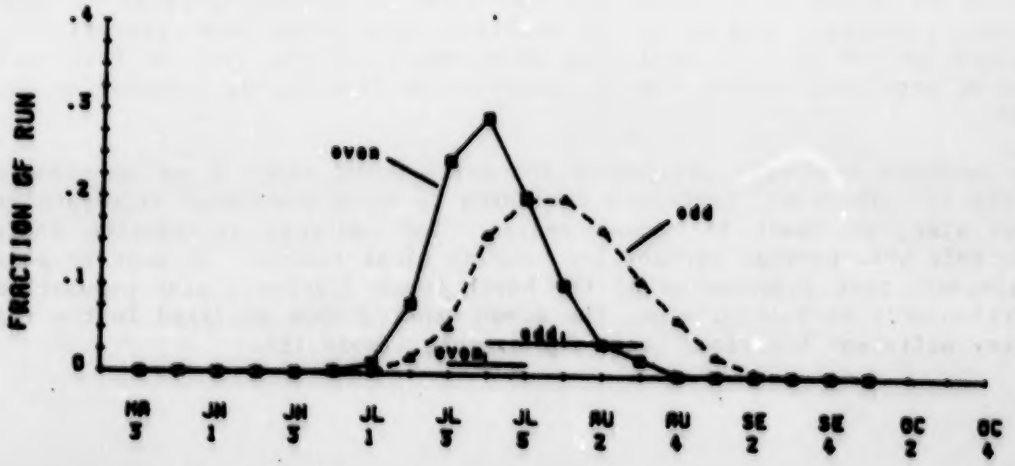
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Summary

This report has presented an analysis of northern British Columbia pink salmon stocks from 1970 to 1982. While there are many genetically distinct pink stocks, from a fishery management perspective many of these can be aggregated into stock groupings, using such criteria as common geographical location, timing or migration routing. Consequently the term 'stock' as used in this report refers either to a genetically distinct population or to an aggregation of such populations, depending on management requirements.

The results presented herein were obtained using the run reconstruction methodology. Taken together, the reconstruction inputs comprise the best available data base for many types of stock assessment analyses. While much of the data is based on informed judgements rather than on experimental results, and is certainly liable to be improved and updated over time as new information is obtained, there is considerable value in bringing it together in one location as a benchmark for future ananlyses.

Table 16 summarizes the reuslts of the reconstructions, displaying for each stock the trend in even-year and odd-year run size and escapement over the time period 1970-82. Judging trends in data is a somewhat subjective exercise; where it seems appropriate, more recent years have been emphasized in making such judgements. In any case, the reader is encouraged to examine the stock-by-stock results and come to one's own conclusion.

Also shown in Table 16 is an estimate, for each stock, of the level of confidence we place in the results for that stock, measured as a 'high', 'medium' or 'low' level of confidence. The estimates are based largely on our perception of the reliability of the data base for each stock. A low level of confidence arises from poor escapement data, a poor understanding of escapement timing, and higher than average uncertainty about migration routes, diversion rates, and 'proportion local' for the catch in each fishery.

The combined Queen Charlottte Islands pink salmon population shows a considerable decline in both even-year and odd-year escapements (Fig. 3). Even-year catch and total run size have also decreased over the period 1970-82, while odd-year catches have increased. Odd-year run size follows escapement in declining during the early 1970s, but then shows an increasing trend in response to larger catches. However it is doubtful that these high catches can be maintained in the face of declining escapements, unless they in fact reflect catches of non-local stocks (due to incorrect or fluctuating "proportion local" factors).

The combined even-year escapement for North Coast pinks shows no trend over time (Fig.5). There is perhaps a declining trend in even-year aggregate catch and run size, at least in recent years. The odd-year aggregation exhibits considerable year-to-year variability, but no clear trends. It must be pointed out, however, that examination of the North Coast aggregate pink population is not particularly revealing, since the seven stock groups analysed in the region show very different behaviour (see, for example, Table 16).

Table 16. Trends in pink stocks (run size and escapement) from the Queen Charlotte Islands, North Coast and Central Coast, together with estimates of confidence in the results for each stock.

Stock	Trend		Level of Confidence
	Even-year	Odd-year	
Area 1	no trend(?)	decreasing(?)	low-medium
Area 2W	decreasing	—	low
Area 2E	decreasing	decreasing	low-medium
Kmouk/Isbaenaidth	no trend	increasing(?)	medium
Kainsmaan/Khutsumateen	no trend	decreasing(?)	medium
Area 3 Coastal	decreasing(?)	no trend	low-medium
Upper Skeena	increasing	decreasing	high
Lower Skeena	decreasing	increasing	high
Area 4 Coastal	no trend	decreasing(?)	medium-high
Area 5	no trend	no trend	medium
Gardner	no trend	increasing	medium-high
Kitimat	decreasing	increasing	medium-high
Douglas	no trend	increasing	medium-high
Laredo Sound	no trend	decreasing	low-medium
Fraser-Graham	decreasing	no trend	low-medium
Aristazabal Island	no trend(?)	no trend	low-medium
Laredo-Campania	no trend(?)	increasing	low
Area 7	decreasing	increasing	medium-high
Dean Open	no trend	increasing	medium
Dean Closed	decreasing	increasing	medium
Fisher-Fitzhugh	no trend	no trend	medium
Bentinck	no trend	increasing	medium-high
Burke	decreasing	increasing	medium
Area 9	decreasing	increasing	medium-high
Area 10	no trend	increasing	medium

Perhaps the most striking feature of Central Coast pink is the overall decline in total run size for even-years between 1970 and 1982 (Fig. 7). Over this period the run size decreased in at least eight of the 15 even-year stocks while none showed an increase (Table 16). The decrease was particularly large for the Kitimat, Area 7 and Area 9 stocks, three of the larger even-year pink stocks on Central Coast. Coincident with the decline in even-year returns was an increase in size of many of the odd-year runs. The increase in run size of the odd-year stocks from statistical area 8 can be at least partially explained by recent management initiatives designed to rebuild these stocks. However, there has also been an increase in the run size of most other Central Coast odd-year stocks suggesting other factors may be involved. The net effect of changes in the even-and odd-year run sizes has been an overall reduction in the total returns of pink salmon to the Central Coast between 1970 and 1982.

Another interesting feature of Central Coast pink stocks is their high degree of inter-year variability in run size. While not quantified, the variation in run size between years is clearly greater than that shown by Central Coast sockeye (Starr et al. 1984). In addition, for practical purposes, there appears to be little if any relationship between the number of spawners and the number of recruits they produce for most Central Coast pink stocks. For example, an escapement of 230,000 Douglas pink in 1970 produced a run size in 1972 of 2 million pieces. However a similar escapement in 1972 produced a run size in 1974 of only 126,000 pieces. This type of ambiguity in the stock-recruitment relationship was evident to some degree in all Central Coast pink stocks.

We have attempted in this report to bring together and analyze relevant data on northern British Columbia pink salmon stocks. Information has been produced that will enable the determination of pink stock status, relative to 'optimal' levels, and the potential for enhancement of northern pink stocks.

Updating of the input data used in this report is to be encouraged, as new information becomes available over time. We have indicated areas where data of better quality than currently exists would be particularly helpful both to stock assesment and to management. This report should be seen therefore, as providing both an indication of past performance in the fisheries, and a suggestion of possible directions for further research.

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